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A HANDBOOK

OF

MANCHESTER ROYAL INFIRMARY

THERAPEUTICS:

BY

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PREFACE.

As this work is designed for students and young practitioners, the author has omitted, as far as possible, controversial and speculative questions, and has confined himself to the humbler, but to him the more congenial task of stating what is practically known of the application of remedies in disease. It is also right to state that this work is merely an introduction to Therapeutics, and is by no means intended to supersede larger works on this subject; thus the author has omitted many matters altogether, and has treated of others very briefly.

It remains to acknowledge the obligations the author is under to the works of Buchheim, Parkes, Stillé, and Clarus. From Buchheim's work has been borrowed, with slight alterations, the arrangement of the subjects. The author is also indebted to his friend, Mr. W. Vickers, for much assistance and many suggestions during his investigations on the effects of actæa racemosa, and lobelia inflata.

THERAPEUTICS.

OXYGEN.

Oxygen is at present of rare use in medicine, as no ready way of preparing or applying it is yet known. It has been recommended in phthisis in its non-febrile forms, and is said to be of especial service when the stomach of these patients is deranged.

In asthma, according to Beddoes and Demarquay, it is useful. They caution against its use if heart disease co-exist.

In anæmia, from loss of blood or suppuration, it is considered by some persons to increase the appetite and digestion, and so to improve the strength.

Demarquay asserts the power of oxygen over some forms of diabetes, and states he has, by its employment, reduced the sugar in the urine by one-half, the diet remaining unchanged.

The gas is useful as a local application to atonic painful sores, but is without benefit when applied to healthy ones. In senile gangrene it is said to be of the greatest use. It is applied as a gaseous bath, and its use should be continued for an hour or longer at a time, and be repeated six or eight times a day. The results are these—the livid red is changed to a rose colour, warmth returns to the tissues, feeling is restored, pain eased, and the disease checked, and even cured.

ON THE INTERNAL USE OF WATER.

The troublesome pain of toothache may very often be greatly lessened and even removed by rinsing out the mouth for some

minutes with water as hot as can be borne. It sometimes occurs that cold succeeds better than hot.

Although perhaps not exactly within our present subject, a few remarks may be made on the drinks best suited to fever patients. With such persons the thirst is most distressing, and is often the cause of much restlessness and irritability, which in their turn increase the fever. The thirst must therefore be allayed, but if these persons be left to satiate their desire, they will always drink too much, which excess is very liable to derange their stomach, to impair digestion, produce flatulence, and even diarrhœa. This being so it is our object to adopt such beverages as shall most effectually allay thirst, and experience as well as theory shows the drinks made slightly bitter and a little acid fulfil this object most effectually. A weak infusion of cascarilla or orange peel, slightly acidulated with a little hydrochloric acid, was a favourite drink for fever patients with Graves of Dublin. Raspberry vinegar may also be used. Sucking ice is very grateful to such persons. Sweet fruits, although at first agreeable and refreshing, very often give rise to a disagreeable taste in the mouth, and may also produce flatulence or diarrhœa, and must therefore be taken with moderation and care. There is no advantage in "curtailing beyond a moderate degree the amount of water drunk by diabetic patients. The urine and sugar may by this means be lessened, but the general distress is increased" (Roberts). Prout recommends in such cases tepid drinks.

Stomach.—Water is necessary for both the digestion and solution of food, but an insufficient, as well as too large a quantity, are alike harmful. It is well known that the character of the fermentations is dependent on the amount of water which is present. For instance, with sugar, if there is too little, no fermentation at all will happen, while, on the other hand, if there be too much then we have acetous instead of vinous fermentation. It is more than probable that the quantity of water taken with the food may, in a similar way, affect the changes which it undergoes in the stomach. This much is certain, that dyspepsia is often aggravated by drinking habitually with the meals an excess

of water, and on the other hand this affection in some cases appears to be connected with an insufficient quantity of fluid. Flatulent dyspepsia can often be traced to excess of drinking at meal times.

It is easy to understand how too much water taken with the food impairs digestion, as it dilutes the gastric juice, and so weakens its solvent power for food. The popular idea proves to be the correct one, that drink should be taken chiefly at the end of the meal, when it serves many useful purposes. It then aids the passage of the peptones from the intestines to the blood, and by their removal favours the continuance of digestion, as it is considered that these peptones hinder digestion while they continue in the intestines. Then again, indigestible substances which are only partially dissolved, may, by drinking water, be carried through the pylorus into the intestines, and be there subjected to further digestion or eliminated with the motions, and by their removal from the stomach a source of irritation is prevented. The common modern practice to drink tea a short time before dinner cannot be too strongly denounced, unless several hours elapse between the early tea and the dinner.

But in our desire to avoid the ingestion of too much drink, we must be careful not to err on the side of too great abstinence, as it has been shown that a certain amount of water favours the secretion of the gastric juice, and, as we have seen, the passage of the peptones into the blood. Iced drinks often do harm when taken at meal times, by constringing the vessels, and preventing the secretion of the proper amount of gastric juice. Warm water, or various infusions, such as camomile tea and mucilaginous drinks, are employed to promote vomiting after emetics have been administered. The quantity of fluid taken for this purpose should not be too large, or the stomach is distended and its muscular walls paralysed, and vomiting is then impeded and not promoted. From half a pint to a pint is sufficient.

Intestines.—Its action here is similar to that in the stomach, and it is necessary for the absorption of the digested substances in this part of the canal.

A glass of cold water taken early in the morning is to many

people a purgative, and diarrhœa is also often increased or maintained by a too free indulgence in fluids.

After free water-drinking, the water, but not the solids of the fæces are increased. Water tepid or cold is employed for injections into the rectum, to produce an evacuation from the bowels.

Water passes readily into the blood, but with some limitation, as when its loss from the system, from any cause, has been great, it is absorbed with much avidity, and by its rapid passage into the blood may materially affect that fluid, and, it is said, lead to such rapid destruction, by osmosis of the blood corpuscles, as in some cases to have destroyed the life of cattle.

When the quantity of water in the blood is already large, the absorption of a further quantity from the stomach and intestines is much curtailed.

The excess of water is eliminated in various ways. Some, as we have said, passes off by the intestines; some is thrown off by the skin and lungs; but most is excreted by the kidneys. The chief part of any excess of water is eliminated in six hours, but after strong exercise much is retained in the muscles for a considerable time longer.

Copious drinking has a further action on the urine than that just mentioned, for not only is the urinary watering increased, but also other constituents, as urea, phosphoric and sulphuric acids, and chloride of sodium.

The increase of these, with the exception of the last, is permanent, but of the chloride of sodium, it is only temporary, and after a while the quantity of this separated by the kidneys falls below the quantity excreted in health, and so the previous increase is balanced, and water must therefore be considered in respect of common salt as merely a temporary eliminator. The case is different, however, with urea, phosphoric and sulphuric acid, for while the water-drinking continues the increase of these is permanent, and hence there occurs not only an increased elimination, but also an increased formation of them. This can only occur from an augmented disintegration of nitrogen and sulphur containing substances. If it possessed this power alone, it would merely lead to loss of weight; but with this rapid dis-

integration there usually occurs a corresponding increase of assimulation in the same tissues, and so it happens that water taken under certain precautions may increase both construction and destruction of tissue, and so act as a true tonic, and improve the vigour of the body and mind.

We here have an explanation of the good which often accompanies the "water treatment" in hydropathic institutions.

The effects of water-drinking are different in different people. The disintegration spoken of is greatest in weak people, on whom it may produce an almost febrile state. It is greater in children than adults, and perhaps more in women than men. A high temperature of the water, or of the external air, increases its influence. Bodily exercise has the same effect.—(Parkes on Urine).

COLD.

Cold, according to the method of its employment, may be either a refrigerator, a tonic, an excitant, a depressant, or an anæsthetic. It is proposed, in the present place, to speak in general terms of the effect of cold on the body, and reserve for a subsequent place the remarks in detail, on ice, cold water, and the various cooling appliances by means of which heat is generally abstracted from the body.

Refrigerant.—By cold, heat is withdrawn from the body, and both the surface and deep parts are cooled.

If the application is limited to a small surface of the body, its effects are correspondingly limited.

By the general cold-bath, a very considerable reduction of the heat of the surface may be obtained. This may reach 10° Fah. in the trunk, and considerably more in the extremities. It might hence be thought the general cold-bath is a great refrigerator of the surface of the body, and is capable of reducing the heat for a considerable time. Such, however, is not the case, for very speedily the heat is restored again to the skin of the trunk, although the extremities may remain cold for some hours longer. In a few minutes the temperature in the axilla has almost re-

covered itself, although the bath (60° Fah.) has been continued at a temperature of 60° for half an hour, or more.

It is not, of course, here maintained that heat is not abstracted from the body, but, as will be shown at another place, this is so rapidly restored, that in health the cold-bath cannot be considered as able to effect a depression of temperature of the skin for any length of time.

Cold sponging, so much used, and with such great relief in fevers, has, as may be ascertained by aid of the thermometer, a very slight and transient influence on the heat of the body, and hence the sense of comfort experienced by the sponging cannot be ascribed wholly, or in part even, to the refrigerating influence of the application.

Such relief may be explained by the removal of any impurities which may irritate the skin, or annoy the patient by their smell, and by an abatement in the acridity of the skin, for it is well known a hot dry skin is a source of much greater discomfort than one even hotter, but moist. The sponging of the surface by tepid water removes such acridity by restoring moisture to the skin, and so gives ease and comfort to the patient.

The remarks which have just been made apply only to the surface of the body; but the general cold-bath can also effect a reduction in the temperature of the internal organs. Such a reduction is never very great, and is even more quickly recovered from in the deep than the superficial parts, and, as might be inferred, the application is still less efficient as a refrigerator of the internal than the superficial organs. The general cold-bath must, therefore, in fever-free people, rank very low, as a refrigerator.

It may, however, be otherwise with the body whose temperature is unnaturally raised by fever. Indeed there is reason to believe that the general cold-bath or frequent packing with the cold sheet, may effect in some fevers, perhaps all, a considerable and durable reduction of the temperature; whether this is accomplished, if accomplished it be, by mere abstraction of heat, or by preventing its unnatural formation, it is impossible at present to decide.

Tonic.—Cold, when judiciously employed, is a powerful tonic to the body. Its effects in this respect are well known. A cold climate, and cold bathing are tonic and bracing. The explanation of its action in this respect is probably found in the following considerations. During exposure to cold the loss of heat from the body, as judged by the thermometer, is by no means a measure of the quantity withdrawn. It has been shown by many observers, that at such times increased combustion occurs, whereby much of the lost heat is compensated, and the temperature maintained or soon restored. This increase in the oxidation of the tissues is demonstrated by the greatly increased quantity of carbonic acid thrown off by the lungs on exposure to cold. This increased oxidation it is which probably explains the tonic effects of cold, and in the following way :—

The most vigorous health is best maintained by a rapid construction and destruction of tissues within certain bounds, and provided these two processes be equally balanced. By exposure to cold, more oxygen is absorbed by the lungs, and more oxidation of the tissues results, by which the processes of destruction and construction are greatly promoted. How this is effected, will be better understood in the following remarks :—

In nutrition we have (apart from the nerves) three factors at work, the nutritive plasma, the tissues, and oxygen. When food is taken, digested, and introduced into the blood, both formation and destruction of the nitrogenous tissues begin. The former is limited by the latter, when the destruction of tissue ceases, the further assimulation of the nutritive materials of the blood also comes to an end. These destructive changes are in proportion to the amount of oxygen absorbed. When this is exhausted, many of the products of destruction remain only partially oxidized, and further disintegration of the tissues ceases, and with this cessation, assimulation also ends (Parkes).

By exposure to cold, oxygen is abundantly absorbed, the effete products in the blood are first consumed, and that important fluid is purified, and more fitted for the nourishment of the body ; next, by its action on the tissues, consuming them, oxygen promotes the cycle of changes described, and food is taken and assimu-

lated, and thus destruction and construction of the tissues progress rapidly, and great vigour of body is obtained. It is thus that cold climates are invigorating, and produce robust and active health.

Local Tonic.—When applied locally, cold may be a local tonic (see Douche), but, if continued too long, or if the cold is excessive, it depresses the part to which it is applied, for by contracting the vessels, it lessens the supply of blood to the tissues, and thereby diminishes in them cell growth and tissue change. If the cold be intense, and applied for some minutes, all function in the part ceases, and sensation is lost. Cold thus applied becomes an anæsthetic.

If such a cold application be too long continued, the part dies and becomes gangrenous. Suddenly and locally applied cold may act as an excitant, as is shown by the following examples:—

The cold hand applied to the abdomen excites contractions in the parturient womb. A few drops of cold water sprinkled over the face is a popular way of exciting breathing, and restoring consciousness in persons in a swoon. The same treatment is employed to establish breathing in weak or still-born children, or in persons over dosed with chloroform, or in the narcotism from opium or drink.

After these general remarks on the effects of cold, we shall next speak in detail of the employment of cold water, as in the common and sea-bath, shower-bath, the douche, and cold effusion.

Baths.—Cold water may be employed either on account of its moisture, or its temperature, or both. If we merely require moisture, and the temperature is of no consequence, tepid or warm water is used as being both preferable and more agreeable. It is on account of its temperature that cold water is generally employed, that it may abstract heat from the whole surface of the body, or from some particular part of it, or by its application to produce general or local excitement and shock.

On the Cold Bath.—As the skin neither absorbs the water of the bath, whether it be warm or cold, nor any substances,

soluble or not, which may be added to the water, it follows that whatever effect baths may produce in the body, must be explained by their direct action on the skin.

In our remarks on the general cold-bath, we shall speak mostly of cold sea bathing, as this is a far more powerful medicinal agent than the general simple cold-bath, although the action of both is the same, and their difference is merely one of degree. We shall point out as we proceed in what way they differ, and how these differences affect the body.

On entering a cold sea-bath, a feeling of depression, great or little, according to the coldness of the water, is experienced. The skin grows pale and shrivelled, and presents the appearance called "goose skin," produced by the contraction of the skin, and the consequent protrusion of the hair roots and follicles. There is general shivering, with some blueness of the lips, nose, and prominent parts of the body. The temperature of the skin is considerably reduced. The pulse is quickened, and the breathing convulsive and sobbing, most so, as the water rises to the chest if the bath be entered slowly. The system soon becomes roused to meet and resist the depressing effects of cold, and in a few seconds a feeling of general exhilaration ensues. The skin becomes ruddy and glows. The breathing is full, frequent, and easy, the pulse rather quick and strong, the spirits are exalted, and there occurs increased vigour of both mind and body. If the bath be now left, or before the period of exhilaration ceases, the condition remains more or less for the rest of the day, and the bath then acts as a tonic to the system.

Should the bath, on the other hand, be prolonged, depression again supervenes. The person feels cold, there is shivering, with blueness and numbness of the more exposed and smaller parts, from which, on account of their size, warmth can be the more readily withdrawn. There occurs a feeling of depression, of misery and wretchedness. Baths prolonged to such consequences, often produce in the bather disagreeable results, which may continue for hours, and even days, and inflict serious damage on the health, the greater, if the patient is weak or young. There is then complained of, for many hours after the bath,

general langour, with a great disinclination to exercise, whether of body or mind. The temper is peevish, fretful, and irritable. Sinking at the epigastrium, with loss of appetite, is experienced. There is much chilliness of the surface, with coldness of the extremities. The circulation is feeble and languid. It need scarcely be said such consequences are to be most carefully avoided, and yet, unless minute directions are given to persons as to the time for bathing with other particulars, such will almost always be obtained, so great is the ignorance and error which prevails amongst the laity on this subject.

If the exposure to cold, as in the cold bath, be still continued, or if the cold is great, there soon supervenes great depression and a feeling of misery and wretchedness, followed shortly by heaviness and drowsiness, which deepens into coma, till a kind of apoplectic state is reached, and asphyxia ensues from paralysis of the muscles of respiration, and consequently death.

It would thus appear, that baths, on the one hand, may be most powerful tonics, while, on the other, if wrongly used, they may cause great depression of the powers of the body, and produce great harm. The good offices effected by baths have been placed beyond mere surmise, and have been established by direct experiment, from which it has been found that sea-baths act altogether more powerfully on tissue metamorphosis than the simple water-bath. That while both the process of destruction and construction of tissue was increased, the latter was augmented in excess of the former, so that there happened an actual increase in weight as well as increased vigour of the functions of the body. As sea air acts in the same way, it is difficult to say what amount of the improvement in health results from the effects of the air, and what from the employment of the sea-baths.

It is for its tonic effects that the cold-bath is almost universally employed, and it is of its application in this respect that we are now speaking. To obtain this wished-for result, it is necessary that the bath should be discontinued at the time it causes general exhilaration, for then the system appears to be roused into action to resist the depressing influence of the cold,

and this general stimulation, if the bath be now discontinued, remains. For, at the time the bath is employed, and probably for some time afterwards, oxidation of the tissues is increased. The blood is purified of effete products, and the construction and destruction of tissue on which vigour of both mind and body appears to depend, are heightened. There thus occurs from bathing increased appetite, increased digestion, and assimulation of food.

The bath is, in the strictest and fullest sense of the word, a tonic.

The good effects of the bath when used in accordance with the rules to be immediately laid down, is soon apparent in the generally improved condition of the patient. The complexion becomes ruddy and clearer. There is a gain in weight. The muscles especially, if exercise be conjoined, gain in firmness and strength. There is increased mental vigour, and often any impairment of the mind, caused by deficient nutrition of the nervous system, disappears, and soon a complete restoration of general health is accomplished.

The important question hence arises, how can we best obtain these stimulating and invigorating effects of baths?

Our object is to secure the greatest amount possible of stimulation, and to secure the continuance of the increased vigour of nutrition as long as possible. This last result is obtained, as we have seen, if the bath be left at the time of general exhilaration and stimulation, and before the last stage, that of depression, begins. To accomplish our first object, namely, to obtain the greatest degree of stimulation, we must duly apportion the bath, as to its temperature and duration, to the strength of the patient.

If the patient be very weak, there occurs but little rousing of the functions to prevent the depression from the cold, and if this be intense, there may be no stage of stimulation, but the patient is from the first depressed, and may remain so for a long time.

Weak persons are thus often seriously injured, and life even endangered by cold bathing.

The depressing effects of a cold bath are proportioned to its

coldness and duration. The colder the water the greater the depression it occasions. This is also greater when the water is in motion than when at rest. The longer, moreover, the bath is continued, the greater is the depression it produces.

Thus in giving directions concerning sea-bathing, we must have regard to the strength of the patient, the temperature of the water, and the time the bath is continued.

The two latter must be regulated to the condition of the health.

If the patient be weak and much prostrated by previous illness, the bath must not be too cold, nor continued too long, and the water should be at rest.

It will here be convenient and profitable to consider in what way sea differs from simple water-baths, and thus to explain the superiority of the former, as a tonic, to the latter.

1st. In sea water we have various ingredients dissolved.

2nd. The variations in its temperature in the different seasons of the year are much less than those in river water; and, lastly, while the sea is always, more or less, in motion, river water is comparatively at rest. The salts in solution are supposed to act as stimulants to the skin, and thus to favour exhilaration. Hence it is that patients, who cannot bathe in simple water without suffering great depression, can do so in sea water with very great benefit. As, moreover, the temperature of the sea never falls very low in the winter, bathing in the sea may often be continued late in the autumn, or even into the early winter months.

Of the motion of the waves we have already spoken. It increases the depressing effects of the bath; but if the patient be strong enough, it also increases the reaction which ensues, and thus is more exhilarating to the strong, and is at the same time highly agreeable.

If we keep these guiding principles in mind, we shall at all times be able to give correct answers to the various questions which patients may put to us concerning bathing.

One of those most frequently asked of the medical man by

his patient when about to start for a watering-place is this, How long shall the bath be continued?

Our answer to the question must be regulated by the strength of the patient and the coldness of the water.

If the water be cold, or the patient very weak, out-door sea-bathing must be forbidden at first, and in its place a tepid one be used, the temperature of which should be slowly reduced until that of the sea is reached. Then, if the day be fine and the sea calm, the bath may be taken in the open air. If it should be considered safe for the patient to bathe in the sea, and if he be very weak and unaccustomed to bathing, the stay in the water must be very short. It will often be sufficient for weak persons to allow two or three waves to pass completely over them, and then at once to leave the water and wipe themselves thoroughly dry, using plenty of friction to the skin. As the strength increases, and they become accustomed to the effects of the water, the bath may be continued for a longer time, but it is seldom advisable for a convalescent to bathe longer than five to ten minutes.

The warmer the water, the weaker may be the condition of people who may be permitted to bathe, and the longer may their stay in the water be.

Then as to the time of the day best suited for bathing. On this subject the greatest ignorance prevails. It is currently believed to be best to bathe before breakfast. Yet even for the robust this practice has risks, and even such persons are often made very poorly and much fatigued for the rest of the day.

As we have before said, our object in using the bath is to obtain as much and as prolonged stimulation as possible. We must therefore choose such a time of day when the body is most refreshed, invigorated, and nourished. It might be thought that these conditions were all present during the early morning hours after a sound and refreshing sleep. But it must be recollected, that before breakfast the body is suffering from a prolonged fast of several hours, and in want of food, without which the functions may be very readily depressed. Theory and experience thus speak alike against the hour of the day for bathing, and

both point to a time between breakfast and dinner as most appropriate.

This leads us to the consideration of another question, namely, how long a time should be allowed to elapse after a meal before a bath may be administered, and what time should pass after its use before food should be again taken. Cold bathing produces a great shock to the skin and system generally. Any powerful mental or bodily impression is sufficient to arrest, or check for a time, many of the functions, even if they are in active performance of their duties. Such is the case with digestion. Any great excitement, as is too well known, can stay, more or less completely, this process, and the cold-bath is generally sufficient to completely effect this hinderance. A sufficient time, therefore, should be allowed to transpire before the bath is taken, to permit of the almost complete digestion of the breakfast, that is, an interval of about three hours. Neither should the bath be employed immediately before food is taken, for the reason just explained. If this rule is broken, there occurs little or no secretion of the gastric juice, and food lays only partially digested on the stomach.

And for a somewhat similar reason, the bather should not be under the influence of any great emotional excitement, whether this be pleasant or painful in character. At such times the nervous force of the system (on which there appears to be set a limit) is directed strongly in one channel, and no nervous stimulation follows on the application of the bath. Persons thus excited are often, by bathing, much depressed, and made languid, cold, and shivering. Obviously for the same reason children must be coaxed, and not dragged against their will into the water. In early life there is often much terror of bathing. If, in spite of this, the child be forcibly dragged into the sea while screaming with fright, the worst effects will follow, for no stimulation will be obtained, but the child remains often for days depressed and ill.

Is there any age in which sea bathing is dangerous, and should be prohibited ?

As young children—those, for instance, under two years of

age—are very impressionable, and as the shock of a cold-bath is too great for them, it is generally accepted that such young persons should not have cold sea-baths given them. Equal care is necessary at the other extreme of life, as in such the powers of the body are enfeebled and incapable of being very actively roused to meet the demand made on the system by the cold application. The power to form heat, as is well known, is very much reduced in old people. And, further, too much vascular excitement may be dangerous in the old, whose vessels are often very brittle from degeneration, and are in danger of being ruptured in the brain and causing apoplexy if any unusual strain is brought to bear on them.

From what has preceded, it will have been gathered that fatigue is a condition of body which strongly prohibits the use of cold bathing. On this account it is seldom advisable for persons of weak health to take a bath on the day following their arrival at their destination, even if the other condition, as age and general state, should be favourable.

It is advisable to wait till all fatigue is recovered from.

Does pregnancy forbid sea bathing?

If the woman has had several miscarriages, or has aborted, or if she be of an excitable temperament, or if pregnancy be far advanced before the bathing be commenced, then baths may be expected to do harm, and to produce abortion. But under other circumstances, and with due regard to the conditions which have been mentioned, both the mother and the child will be benefited by the bathing. Neither need a female discontinue bathing at the menstrual period, if she has been accustomed to the practice before it begun, but it is always inadvisable to begin the use of this agent at such a period, as the shock may be sufficient to check or arrest the secretion, and thus to produce, perhaps for many months, amenorrhœa.

In the choice of a coast, and of the time of year to recommend sea bathing, we must have regard to the vigour or debility of the patient. If not very weak, and if the health be only a little injured, then a rugged coast, where the sea is rough and boisterous, should be recommended as both profitable and agreeable to the bather. Should, however, the health be much

broken, then a smooth sea is preferable, and the summer months, if the climate be a cold one, is the only time suitable for the use of this agent.

By exercise taken while bathing, fatigue and even exhaustion is soon produced, and therefore patients, if weak, must be cautioned against this evil. Another evil should be guarded against, which is this: persons invigorated by the bath are in danger of taking too much and too active exercise on leaving it, by which they considerably fatigue themselves, and so the good which might be expected is lost. The amount of exertion permitted must be strictly in accordance with the condition of the patient, who, if weak, should only take horse or carriage exercise.

It not uncommonly happens for the hair to fall off during a course of sea bathing. This naturally excites much anxiety, especially in women; but their fears may be quieted by the assurance of its growth in greater luxuriance than ever. Other troubles may arise from the use of this remedy. For instance, it may happen that constipation, more or less obstinate, follows on bathing. Such an occurrence need not lead to the discontinuance of the remedy, but the evil, if it can, should be removed by exercise, a regulated diet, or if not by purgatives. Of greater trouble are dyspepsia and diarrhœa, which are sometimes met with as the accompaniments of sea bathing. When they occur, the circumstances of the bather, such as the hour of the bath, with the time spent therein, and other particulars must be examined, and any indiscretions should be cautioned against and their practice discontinued; but yet notwithstanding every care, in every particular, and while the diet is proper, dyspepsia or diarrhœa, or both may happen. Should such occur, the bathing must be discontinued, temporarily or permanently. With some even the sea air is sufficient to produce these troubles.

Restlessness at night is another circumstance sometimes produced by sea bathing, which can often be traced to irregularities in diet, or in the hours of retiring to rest, or of food. A late and heavy meal will sometimes cause such restlessness, which immediately ceases on the discontinuance of the heavy meal and on the substitution in its stead of an early, light, and easily digestible one.

Some have their rest broken by stimulants taken shortly before they retire to bed, while, on the other hand, others cannot sleep unless some stimulant be taken soon before bed time.

Bathers should plunge into the water at once, and not stand hesitating till they are cold and shivering, a state which should be carefully avoided, and for which purpose a short walk may be taken just before the bath, to make the surface and extremities warm.

Effects of Cold-baths (of simple and sea water) on the Skin.—The effect of cold is to considerably lessen perspiration, and this in proportion to the degree of cold. A bath, therefore, by its coldness checks at first cutaneous secretion, but on its discontinuance the secretion seems to be considerably augmented, and this is more the case after sea than simple water bathing.

By expulsion from the skin the blood is driven to the internal organs, and congests them. The kidneys are thus affected, and this probably explains the general occurrence of a small quantity of albumen in the urine at the time the bath is employed. It disappears soon after it is left.

The effects on tissue change have already been mentioned, and those statements will receive a confirmation in the remarks now to be made, of the influence of sea-baths on the constituents of the urine. By their use the quantity of urea and sulphuric acid of the urine is increased. It has been doubted whether the increase is beyond the limits of the natural variations of health, and whether the experiments are sufficiently numerous to prove the point in question. It is not to be expected that the increase of tissue change would be very greatly augmented at once, and it is not to be expected it would at any time be increased beyond the maximum amount of health, and consequently neither would the increase of urea be in its turn beyond the maximum quantity of health. But surely if the amount of urea keeps constantly for some time at its maximum, this would prove the influence of baths, as far as would be expected to occur, and would show that sea bathing increases disintegration of the nitrogenous tissues.

The power of sea-baths to promote tissue change and increase

the separation of urea by the kidneys may be shown in another way.

These baths, as we have said, sharpen the appetite, and hence more food (nitrogenous) is eaten.

This must be either stored up in the body or be separated as urea by the kidneys. But although the weight of the individual who takes the bath undoubtedly increases, still this is not commensurate with the increase of nitrogenous matters that is eaten. Hence there must be an additional separation of urea by the kidneys while these baths are used, but if the prevalent idea that all nitrogenous matters must first pass through the transformation into tissue before they can be disintegrated and reduced to urea be correct, it follows tissue change is also promoted by sea bathing.

Beneke's observations lead to the same conclusion. He found when just sufficient food was taken to maintain the weight of the body at a fixed point, if baths were used the body immediately lost in weight and strength, which loss must be due to heightened disintegration of the tissues. But this increased consumption was accompanied by an increase in the appetite, and by increased assimulation, so that when more food was taken the body gained in weight. It is said baths increase the quantity of uric acid, although this is lessened by sea air, but observations on this point are as yet insufficient.

The urinary water is temporarily increased, and often greatly so, but the whole day's urine is lessened in quantity, probably from the subsequent excessive elimination by the skin.

The intestinal secretions were also large (in Beneke's observation), and some water may have escaped in this way.

The use of sea bathing will be made sufficiently apparent from the remarks which have been made, and it is scarcely necessary to occupy much space in a description of the cases in which it may be usefully employed. Mostly in chronic illnesses, where there is debility, sea-baths will yield the best results, but it is especially useful to the convalescents from acute diseases, and those whose health has been broken by over work, or residence in towns with a too sedentary employment, or has been injured by excesses of different kinds. It is a question of much

importance whether persons ill with phthisis should take sea bathing, and our answer to this must be qualified by the circumstances of the case. When the disease is chronic, and the temperature is but little or not at all elevated (little or no fever), when indeed the case is one of fibroid degeneration of the lungs, without active deposition of tubercle or scrofulous pneumonia, sea-baths may be given, if due regard is paid to the rules laid down.

SHOWER-BATH.—From the consideration of the general cold-bath, it is natural to turn to that of the shower-bath. With this latter, the circumstances are the same as with the former, but as the water strikes the body with some force, and the impression it makes on the nerves, or, to use the general expression, the shock it produces is very great, it is sufficient very often to produce extreme depression and much fatigue and languor for many hours, sometimes days, even where the bather is a strong and healthy man.

It is thus a remedy not much used, and where it has been recommended, its employment can be well supplied by that of the sponge-bath, or by the local douche.

And as such is the case, we shall proceed to consider the action and use of these two kinds of baths.

Here we have present all the circumstances of the common bath, and its action on the body is the same. It is invigorating, and also by promoting cleanliness of the skin, it favours health.

It is often employed, not merely for its tonic effects, but also at the same time, on account of the shock it causes to the nervous system. Thus cold sponging several times in the day is by far the most effectual treatment of laryngismus stridulus. This disease is generally at once cured by this application; and it by no means uncommonly happens for the child to lose all traces of the disease after the first sponging; which suddenness of cure conclusively shows that the action of the bath in the cure of the disease is not merely a tonic one; although in this respect, it is very useful, as laryngismus stridulus is very generally met with in weak and debilitated children. If the disease should linger a time, in spite of this treatment, as it is very liable to do when

there is any irritation of the organs of the body, as teething, worms, diarrhœa, &c., even then each attack of crowing can mostly be at once cut short by the use of the cold sponge-bath, and in this way very often general convulsions be averted. It is well known that in laryngismus stridulus, by the spasm of the glottis and the asphyxia it produces, convulsions are often produced. Indeed, laryngismus stridulus is one of the most frequent causes of convulsions in children, and it is by these convulsions the disease sometimes destroys life.

Also in the treatment of chorea, cold sponging repeated several times a day, deservedly holds a very high place. Whether it accomplishes its good effects by acting solely as a tonic, or whether the shock it produces plays any part in promoting the cure, it is at present impossible to decide. Of the usefulness of the treatment there is no question, and yet in the employment of this agent, circumspection must be exercised, or the patient may be made worse instead of better by it. It must be avoided if there is any rheumatism present, as this will be generally made worse by the cold sponging, and with its aggravation there will be an increase of the choreac movements. If there be no fever, and no pain in any of the joints, then the cold sponging may be reasonably expected to yield most satisfactory results. In the treatment of rickets, cold sponging holds a very high place. In such cases the improvement it works is owing to its tonic properties. But here again care must be observed, or we may do the child much harm.

We must remember, that such patients are not only often very weak, but are very impressionable on account of their tender years, and for these reasons it is of the highest importance the application of the cold sponging be adapted to the condition of the patient.

The method adopted by the author is the following:—He directs the child, if old enough to stand, to be placed in warm water as high as the ankles, and before a good fire. It is then to be sponged all over, except the head and face, for a time varying from two to five minutes; after which the skin is to be carefully wiped dry and well rubbed with a soft and rough towel. If the

child is weak it may then be placed for a short time back again in the warm bed, by which the reaction, as it is termed, is promoted. The sponging should be administered to the child as soon as it leaves its bed; but if very weak, or if unaccustomed to it, it is advisable to give a light and early breakfast about an hour before the sponging is commenced. The following is another excellent method of administering the cold sponging to weak persons or to timid children, and therefore a plan to be adopted when this agent is used in the treatment of chorea. The water should be at first tepid, and then its temperature be gradually reduced by drawing off the warm and adding cold in its place; by this means we avoid the shock, but obtain the tonic effects of the bath. This method succeeds most admirably with children, who, from timidity, are often very much frightened by the bathing, and sometimes scream so violently as to lead the friends to fear an attack of convulsions.

Adult persons whose health has been impoverished, may do much to restore it by the use of cold sponging. For this purpose it is useful in anæmia, leucorrhœa, amenorrhœa, spermatorrhœa,* and in the nervous state, which some men suffer from who work in hot, close, ill-ventilated rooms, or whose work is in the night time, &c., &c.

If the weather be cold, the water should first be made a little warm and the temperature be daily lowered. The depressing effects can generally be prevented in those who are very weak by taking a little light food about an hour before the bath, and by returning to bed for half an hour after it is finished, to restore the warmth to the skin and extremities.

Before we close our remarks on this subject, it may be added that the following condition, not uncommon in young children, may be remedied or even removed by cold sponging, repeated night and morning.

With some children the rest is much broken, and so the health much impaired, by their frequently waking up at night

* It is useful to allow the testicles to be suspended in cold water once or twice a-day, for a few minutes. The same course may be advantageously employed in varicocele.

from "a catch in the breath." For some unexplained reason, they cannot for a time get their breath, and wake up with a loud snore. This is a condition different altogether from laryngismus stridulus, for the fault appears to lay in the soft palate, and not in the larynx.

Effusion and the Douche.—The cold water here impinges on the body with considerable force, and the nervous impression which occurs is correspondingly great. With the douche the water is directed against the body in a large stream, and sometimes it is applied to every part of the surface in succession. The depression it produces is too great to admit of the frequent employment of this application. Most generally it is modified, and the cold effusion is used in its place. Here cold water in pailfuls is dashed over the surface of the body. This application is recommended to be used to persons struck down and unconscious by sunstroke. Many years ago effusion was employed in the treatment of the acute specific fevers, and was especially recommended in scarlet fever. This mode of treatment comes to us sanctioned by the authority of many of the ablest medical men of the past generation. Yet the reaction in the present day against all very energetic treatment is so great that this treatment is now very rarely adopted.

Fears are entertained lest serious consequences should ensue, but such need not be dreaded, if the effusion be employed at the right period of the disease as has been abundantly shown by Currie and Jackson.

The time for its use is during the first few days of the fever, and when the skin is hot and the rash bright red.

The patient should be stripped, and have dashed over him 4 or 5 gallons of very cold water, and when the heat of the surface returns, this application may be repeated, and may be renewed again and again. By such treatment the fever is much lessened, and sometimes it is stated, even extinguished.

For their local effects the douche and effusion are most generally employed. To arouse persons from the stupor of drunkenness, or of opium poisoning, they are of the very greatest

service, being unequalled by any other treatment when a certain stage of the poisoning has been reached. Under the influence of these substances, when taken in too large quantities, there results stupor more or less profound, which in its turn causes the movements of respiration to be at first languidly performed, and at last to stop, and thus death by asphyxia results.

At this most critical stage of the disease cold effusion, or the cold douche, applied freely to the head, is generally sufficient to remove within the skull the conditions on which the stupor depends, and to restore the consciousness, with which restoration the breathing again becomes natural, and for the time the fears of a speedily fatal termination are removed. In such cases the water should be poured on the head from a good height, so as to obtain as great a shock as possible. The pulse and general state of the patient should be watched, and the vigour with which the application is employed must be regulated by the information obtained from these sources.

By the use of the douche the breathing becomes deeper and more frequent, and the lividity of the face and bloated look soon leave, while the pulse at the same time grows in strength. It may, and indeed often does, happen that a relapse occurs, when the effusion must be again employed, and it should be repeated with each approach of a relapse—by this means life can be sustained long enough to admit of the elimination of the poison, and thus till the fear of death has passed.

If this treatment be promptly and efficiently applied, life may be saved in the most unpromising cases, but it is all-important that the water should be abundantly applied, and often for some time, and from a good height.

Some time may elapse before any good effects become visible, but if the pulse and breathing improve, or continue as they were before the douche was begun, the application should be continued, and such perseverance will generally be rewarded by success. The furious delirium of mania may, in many instances, be quieted by the cold douche. It must be borne in mind that it is a powerful remedy, which makes it necessary to watch most carefully its effects on the strength of the patient. An excellent

method of applying it, and one which prevents too great oppression, is to place the patient in a warm-bath, and apply cold to the head in the manner described above.

The most grateful relief may often be obtained from the severe pain in the head, which is met with in the acute specific fevers, or which results from gastric disturbance, if the water be employed in the way recommended by Dr. Hughes Bennett: "A washhand-basin should be placed under the ear, and the head allowed to fall over the vessel, by bending the neck over the edge. Then from an ewer a stream of cold water should be poured gently over the forehead, and so directed that it may be collected in the basin. It should be continued as long as agreeable, and be repeated frequently. The hair, if long, should be allowed to fall into the cold water, and to draw up the water by capillary attraction." He agrees with Graves, that in some cases very hot water acts more successfully than cold.

The cold douche is also an excellent tonic to individual parts of the body. In this way it may be employed to remove the stiffness in joints which remains after slight injuries or results from rheumatism or gout. Salt may most advantageously be added to the water, and the force with which it strikes the affected part, with the length of time the application is continued, must be regulated by the conditions of the tissues. If very weak, it is better at first to play the water in the neighbourhood of the injured or weakened joint. In spermatorrhœa much good may be effected by the free application of cold water to the perinæum and buttocks two or more times in the day.

Injections of cold water into the vagina may be most profitably employed after leucorrhœa has been checked by appropriate treatment to prevent its return. It should be used night and morning.

ICE.

Ice is frequently applied to abstract heat, to check bleeding, to allay inflammation, and to destroy feeling. When used for

either of these purposes it is first broken with the help of a large needle into small fragments, and then inclosed in a bladder or thin india-rubber bag. The air should be squeezed out of the bag, and this should be tied at its mouth, after it has been one-third filled, on a cork which affords a purchase for the twine. The bag of ice may then be made into almost any shape, and fitted to the inequalities of the body, and into a sort of cap if required for the head.

It is often used to the head in tubercular and simple meningitis, and to allay the severe headache of the early stages of acute fevers. Sometimes it is laid on the epigastrium to ease the severe pain and vomiting of chronic ulcer, or of cancer of the stomach. It may be applied to the vulva when these parts are affected with prurigo. Other treatment is, however, generally to be preferred in this disease.

Sometimes a lump of ice is conveyed into the uterus, or pushed to the rectum, to arrest uterine hæmorrhage after delivery.

Internally it is used for a variety of purposes. When sucked it allays the thirst, and so is very grateful to fever patients. It is used in the same way to check bleeding from the mouth or throat, or stomach. When used to check bleeding from the last named organ small pieces should be swallowed. It is also commonly used in the same way to check hæmorrhage from the lungs.

Few remedies are so successful in combating acute inflammation of the tonsils or throat as the constant sucking of ice. Tonsillitis, the sore throat of scarlet fever, and other acute specific diseases, and even diphtheria, may be much benefited by this treatment. It often proves in these cases most grateful, allaying the sense of heat and the pain, and also checking the abundant secretion of mucus, which is so annoying from the constant hawking and deglutition it occasions. In diphtheria the good from ice is most marked when its employment has been adopted at the very beginning of the complaint. This indeed is true of all inflammations of the throat.

When employed for the purposes just enumerated, the ice should be sucked as constantly as possible, and be continued till

the disease has fairly declined. Ice is employed in the same way to allay the nausea, sickness, and pain of disease of the stomach.

To an inflamed and prolapsed rectum or uterus, it may be applied to reduce the inflammation and swelling, and so enable these parts to be returned to their proper place.

Ice is applied by some to the head of persons with delirium tremens, and of children with convulsions.

Pounded fine and mixed with common salt, in the proportion of two parts of ice to one of salt, it produces a far greater degree of cold, and if applied long enough freezes the tissues and robs them of their sensibility. The mixture is put into a gauze bag, and the whole is placed in contact with the skin till this becomes shrunken, leathery, and of a tallowy look. All feeling is then lost. This application may thus be used to remove the pain of minor operations, as the removal of a toe nail, the opening of an abscess, &c. The ether spray being speedier and more easy of appliance, has in such cases quite superseded the employment of ice.

Dr. Arnott recommended the above mixture as an application to erysipelas.

WARM AND HOT BATHS.

The effects of heat on the body, as might be expected, are, for the most part, the opposite of cold. By surrounding the body with a temperature higher than its own, destruction of the tissues by oxidation is very considerably lessened, and it has been shown by experiment that by increased heat the electric currents in the nerves are destroyed, whereby it may be fairly presumed they are the less able to conduct impression either to or from the brain. These two circumstances may perhaps account for the enfeebling influence of heat on the body.

On the General Warm Bath.—This, if not too hot, is at first highly pleasurable, but soon there is felt great throbbing at the heart, and in the large vessels, with much beating in the head, and a feeling of oppression and anxiety. These sensations

are, however, much lessened, or altogether lost, when perspiration, which is often profuse, breaks out. If the bath is continued the described sensations return, and are accompanied by great prostration, which may even increase to fainting. The pulse is greatly quickened and enfeebled, while the temperature of the body is very considerably raised, and may reach, if the heat of the bath be great, to even 104° Fah., that is to a severe fever height. In this slight sketch of the effects of the warm-bath, it has been stated that they produce perspiration, and after a time weakness, and even prostration of the strength, and it is for one or other of these purposes that they are generally employed.

To increase the perspiration, they are employed in Bright's disease with the purpose of lessening the dropsy, and also to carry off from the blood any deleterious matter which may be retained in it by the inaction of the kidneys. But discretion and care must be used in their employment, for by repetition they greatly reduce the strength of the patient, and cause much anæmia, and so may actually intensify the consequences of the disease itself and even increase the general anasarca for the removal of which the bath is employed.

Much of the dropsy of Bright's disease is due more to the anæmia which exists, than to the presence in the blood of poisonous excrementitious substances. As baths increase both the weakness and anæmia, it is obvious they will also increase the general dropsy.

In their administration in the cases of which we are now speaking, it is hoped that urea, or products which should, if properly oxidized form urea, may pass off by the skin, and so the system be freed of their poisonous effects. It is doubtful if warm-baths can effect these good offices, as it appears to be now almost certain that, in health, no nitrogenous substance finds its way from the blood through the skin. Still there can be little doubt that, under certain conditions, these baths do much good, and a feeling of great relief is often experienced by the patient. If our object and purpose in their employment is to withdraw poisonous matters from the blood, it is time enough to use them when there is reason to expect their existence; but when no such symptoms as

headache and drowsiness are present, they can but do harm by the weakness they produce.

The general warm-bath may be employed with signal benefit to children with either simple or inflammatory fever. It should, if they are not very weak, be used night and morning, for a time varying from five to ten minutes. This soothes and quiets the child, and is often followed by refreshing sleep. It is generally impossible to use the general warm-bath with grown-up people who suffer from acute febrile diseases; but sponging with hot water may be used in its stead, when perspiration will often be produced, while at the same time it calms the restlessness of the patient and favours sleep. The restlessness of convalescence may likewise be soothed, and sleep promoted by such treatment.

The pain of colic, renal, biliary, or otherwise, may be relieved or removed by the warm-bath. Whether its good effects are due to its soothing influence on the skin, or whether they result from the weakness caused by the bath it is difficult to say. It certainly appears that the bath eases the pain before any noticeable weakness is produced. In skin diseases of various kinds the general warm-bath is invaluable. In psoriasis, eczema, icthyosis, urticarea, lichen, and scabies, it may be employed generally with benefit. It has been recommended to keep persons suffering from severe burns immersed for days in the general warm-bath. This treatment is said to ease the pain, diminish suppuration, promote the healing of the sore, and to lessen the contraction of the cicatrix.

The local warm-bath is used for a variety of purposes. It is a common household practice to promote general perspiration, and so relieve catarrh, by putting the feet into hot water just before going to bed. Hot water to the feet, or as the sitz-bath, is of great service to promote the menstrual flow when it is either deficient or absent. Mustard may with advantage be added to this bath, which, as has been insisted on by the late Dr. Graves, should be only employed at the menstrual period, a time which can mostly be easily ascertained by the various peculiar sensations felt by the patient. The applications may be employed every night, or night and morning, for six days, commencing one or two before the period begins. This is a very useful auxiliary to

other treatment, and often succeeds in establishing the secretion and removing the distressing feeling which depends on its cessation. Sometimes from exposure to cold or from other circumstances, this flow is suddenly stopped, to the great annoyance and suffering of the woman. Its return may often be accomplished by the use of the sitz-bath.

Hot water to the legs and feet is often useful to remove headache and, according to Dr. Graves, distressing palpitation of the heart.

It has been recommended by Langenbeck to keep stumps after an amputation immersed in a bath of warm water, which treatment he asserts prevents pyæmia.

Sponging the face, temples, and neck with water as hot as can be borne will often relieve the headache of influenza, of catarrh, and of other diseases.

The *hot-air bath* is used to promote free perspiration, and often succeeds. If it be highly desirable to establish a free flow of perspiration, it may be preceded by the general warm-bath.

Vapour-baths may be used for the same purpose. They are less depressing than the general warm-bath, and produce a much smaller elevation of the temperature of the body, which probably explains this difference in their action.

PEROXIDE OF HYDROGEN.

Peroxide of Hydrogen has been used both internally and externally. Applied to either the skin or mucous membranes, it whitens them and excites a feeling of pricking, and, in delicate structures, a small amount of inflammation. This is its action on the conjunctiva.

When added to venous blood, according to Dr. Stohr, there occurs pretty active effervescence. The solution soon becomes yellowish-red, then pale yellow, and in five or six minutes from the beginning of the experiment, colourless. Afterwards there settles a white flocculent coagulum. The corpuscles themselves when treated with a strong solution, become irregular in outline,

and do not form roulleaus. Added to pus, there is much gas given off, and the mixture becomes turbid with white flocculi. Many of the corpuscles are shrunken or altogether destroyed.

When applied to abraded surfaces, if these are covered with blood or pus, the solution of peroxide behaves in the above explained manner, and the surface is ultimately covered with a thin layer of coagulated albumen. This solution, it is said, may, with decided advantage, be applied to chancreous sores, which then heal in half the time those do treated in the ordinary way. The sore is to be washed with the solution three times a day, and to be continually covered with lint moistened with the solution. Open bubos have been successfully treated in the same manner.

The solution is said to destroy the specific character of a chancreous sore.

Internally, it is reputed to be a disinfectant and slight stimulant.

CARBON. ANIMAL CHARCOAL.
„ WOOD CHARCOAL.

Carbon, in proportion to its porosity, possesses the power to absorb many gases in considerable quantities, and as wood is more porous than animal charcoal, its absorbability is the greater of the two.

All gases are not absorbed by charcoal in an equal degree, for it has little power in this respect over hydrogen, while it absorbs a considerable amount of oxygen, a large quantity of sulphuretted hydrogen, and a still greater quantity of ammonia. On account of this property, charcoal is much used as a disinfectant to remove from rooms bad smells, or to prevent the air in them from being contaminated by the effluvia from foul ulcers. To purify air it is very inferior to chlorinated lime or chlorine gas, as on account of its non-volatility it can only affect the air immediately in contact with it.

It is more effectual when used to absorb the offensive gases given off by foul sores, and it is then very generally employed in

the form of a poultice, when it is mixed either with bread or linseed-meal. Of these two substances the former is to be preferred to the latter, as bread being more porous, permits the gases to permeate the substance of the poultice, and so to come in contact with the particles of charcoal.

Although this is a common method of employing charcoal as a disinfectant of bad smelling sores, it may reasonably be doubted if the charcoal, after it is thoroughly moistened and its pores filled with water, has not lost its power to absorb gases and so to act as a deodoriser. It is certain, that often charcoal poultices fail to act in this manner, and in no way lessen the disagreeable smells proceeding from bad sores. A far more efficient mode of employing the charcoal is to fill small flat muslin bags with it in a finely granulated form, and to place these over the poultice which covers the sore. There is no doubt whatever of the efficacy of this method.

Charcoal poultices are reputed to possess a power over sloughing or gangrenous wounds, and to change their condition, making them cleaner and more prone to heal. It is very doubtful if charcoal possesses such a property.

How does charcoal destroy smells which depend on noxious gases? It has been mentioned above that it is endowed with the property to condense many gases in its pores, and this has been accepted by many as a sufficient explanation of its action. Others advance the following explanation, namely, that the oxygen which is condensed and so accumulated in the pores of the charcoal combines with the other gases with which it comes in contact, and by destroying their composition removes their smell.

Of more practical importance is the question whether the carbon by use loses its property to condense gases or to destroy them, and so loses its deodorizing properties. Buchheim states this to be the case, while others assert, if kept dry, it retains its properties unimpaired for many years. The first of these two statements is probably the correct one, and when deprived of this property it may recover it by being exposed to a dull red heat.

Charcoal has been employed also as a disinfectant, and it has been advised to use charcoal respirators for the purpose. These no doubt, are of service when used against many gases, but at present there is no evidence to show charcoal has the power to hold or to destroy the organic matters which propagate disease.

The substance of which we are now speaking has the power by chemical or mechanical action to carry down from solutions many colouring matters, many bitter substances, alkaloids, and mineral substances. From this action it has been advised by Dr. Garrod to administer charcoal in poisoning by corrosive sublimate, arsenic, morphia, strychnia, belladonna, &c. At present this treatment of poisoning by the above substances has not found much favour with the profession. It also precipitates the colouring matter of urine, and at the same time carries down all the uric acid, and some of the urea in solution. The sugar which occurs in diabetic urine is unaffected by charcoal. As a precipitant of the above named substances, animal charcoal freed from its earthy impurities is found to be the most efficacious; it is said on account of its more finely divided state.

It is employed on account of the angularity of its particles as a tooth-powder, but as it is liable to decolourise the teeth, it is not much employed in this way. In the stomach it would be expected that its action must be chiefly a mechanical one, and yet it is given with very great success in certain diseases of this organ, in which its good effects cannot be rationally ascribed to its mechanical influence. It is said to ease the pain of many painful affections of the stomach, as of chronic ulcer and neuralgia, and also to check heartburn. Its action is most pronounced in flatulence, which it very greatly lessens, and very considerably benefits the patient by removing a very annoying symptom, and one which is mostly accompanied by much depression of spirits.

It appears to check the flatulence which is dependent on the irregular fermentation of the food, and also that form of the complaint which is met with in hysterical persons, and which cannot be connected in any way with changes in the food they take.

It is mainly separated from the body with the fæces. A little it is said finds its way into the blood and lymphates and their glands.

When employed internally, wood charcoal is preferred in doses from 6 to 10 grains. It may often be mixed with equal quantities of bismuth with great advantage.

CARBONIC ACID GAS.

This gas is generally employed when dissolved in water.

Externally, those natural waters containing a large quantity of it are used both in chronic gout, chronic rheumatism, and many chronic skin affections. The action of the carbonic acid is that of an excitant to the skin, in which it produces tingling, with redness and feeling of warmth, and increases the flow of the perspiration, but after a time acts in some measure as an anæsthetic, and lessens the sensibility of the skin, and removes or lessens any pain, which may be present.

Carbonic acid water is usefully employed in painful and irritable conditions of the stomach, in which it eases the pain, and often lessens vomiting when this is present. When used for the latter purpose, it is an excellent plan to mix it with milk, and to drink it in this way. The milk will often then be retained, when previously it was speedily rejected. If with the irritability of the stomach there is also some diarrhœa, then lime water may profitably be substituted for carbonic acid water, but if constipation is present, the latter is to be much preferred to the former.

As gas it has been applied with benefit to the uterus or vagina, when these parts are the seat of painful diseases, as cancer or neuralgia, or ulceration of the os uteri.

NITROUS OXIDE GAS.

This gas of late has been extensively used as an anæsthetic. In order to obtain the most thorough account of its action on the

body, and the best mode of administering it, to remove the pain of operations, the author has appended an article kindly written by Mr. Clover, the best English authority on all practical matters pertaining to anæsthetics. The remarks which follows are in Mr. Clover's own words:—

Effects on Animals.—Dogs and cats obliged to breathe the pure gas are killed in a few minutes; after making the usual efforts to get free they become insensible, make slight convulsive movements, and then breathe stertorously. The breathing always intermits before the heart's action fails. If the animal is brought into pure air when the intervals of breathing are not more than thirty seconds, it always recovers. The recovery is attended with panting respiration.

Administration.—In producing anæsthesia by nitrous oxide, it should be remembered that it is to be given pure, and without any admission of air. The time required to fit the patient for the operation is to be reckoned, not from the commencement of inhalation, but rather from the time when the lungs are finally deprived of all atmospheric air, after which I believe that every patient is ready for the operation in a very few seconds. The gas may be conveyed by an inch tube either from the gas-holder, or from an air-proof bag, holding not less than two cubic feet of gas. The mouth-piece may be made so as to be held between the teeth, but this plan necessitates the pinching the patient's nostrils, and compressing his lips against the tube, which is objectionable. In spite of this a restless patient will sometimes draw in a little fresh air, which will keep him for the next half minute either conscious or in such a state that he will struggle against the operation.

I find the apparatus which I have used for several years for giving 4 per cent. of the vapour of chloroform, answer equally well for giving nitrous oxide. With the view of overcoming the liability of air to get accidentally under the mouth-piece during forced respiration, and for economising the quantity of gas used, I have added to the mouth-piece a supplemental bag, holding about two hundred cubic inches, connected to the mouth-piece by a three-quarter inch tube and stop-cock. A portion of the

expired gas escapes through the expiring valve, and during inspiration the gas is supplied partly fresh from the larger bag and partly from the supplemental bag. Having applied the face-piece the patient should be directed to inhale *freely* rather than rapidly, and to empty his chest at each expiration, so that he may get rid as speedily as possible of the residual air in his chest. Pure gas is so free from taste and smell that it is very readily respired; he should be told that he will hear ringing sounds, and experience a sense of general pulsation, but that he has only to continue breathing freely to procure the wished-for sleep. After four or five respirations the stop-cock of the supplemental bag, which has hitherto been kept empty, should be opened to receive a portion of the expired gas and again supply it at the next inspiration. Lividity of the face is soon observed; this is not a sign of insensibility, and may be disregarded; the eye soon becomes fixed, and if the conjunctiva is touched, the eyelids contract feebly or not at all; the pupil at this stage is of its normal size. Pinching the skin will now produce no signs of pain, a single tooth not firmly fixed may be removed, and such small operations as do not prevent the continuance of the inhalation may be commenced; but it is necessary for enabling the operation to be continued for more than a few seconds, without rousing the patient to a struggling condition, that other symptoms should be produced. Convulsive twitching of the hands and oscillations of the eyeball next occur, and at the same time, or soon after, the respirations become slower and are accompanied with a snoring noise. The pulse should always be carefully watched during the whole of the administration, lest syncope from fear should occur, in which case the patient should be placed in an horizontal position and be freely supplied with fresh air. The pulse remaining regular, and the pupil being only moderately dilated, the gas may be continued notwithstanding the convulsions mentioned, and although the breathing begins to be slow; but if the pupil dilates widely, or if the breathing intermits, air should be supplied immediately. It is astonishing to witness the degree of resuscitation afforded by a single full inspiration of air, and if it is intended to keep up the anæsthesia,

not more than one full inspiration of pure air should be allowed if the pulse continue distinct. Gas should be given for five or six respirations, and be again intermitted. In dental operations, on account of the mouth being open, the anæsthesia can be sustained for a limited time only. I have sometimes prolonged it by continuing to supply gas through the nostrils by means of a cap fitting closely over the nose; but in most cases the operator has time to extract two or more teeth before consciousness recurs, and it will generally be found to be the best plan to allow the patient, after one or more teeth have been removed, to awake sufficiently to be able to rinse the mouth, and then to give the gas again. A piece of wood should be placed between the jaws to keep them open, and it should have a string attached to prevent its slipping down the throat. Most patients are glad to inhale again and again. Many persons find the sensation experienced very agreeable; some appear to suffer as from nightmare; it is very rare to have any complaint made of headache. It is doubtful if vomiting ever occurs from the inhalation of nitrous oxide alone; but when blood has been swallowed, sickness of short duration has been produced; such as we witness after chloroform and ether is unknown. As previously stated, there is nothing unpleasant in the smell or taste of this gas, indeed, it is hardly to be distinguished from common air, when itself absolutely pure, but some patients from timidity resist breathing, and so produce a sensation of tightness in the chest. Hysterical patients when only half under the influence of the gas are liable to have an attack, but it is of short duration, and most of such cases may safely be left to themselves. These subjects may present threatening symptoms when they cease breathing. In a case of this kind a patient is said to have ceased to breathe for two minutes. She had never taken enough gas to prevent her struggling against the dentist, and was either faint from the violent efforts she had made, or else was just conscious that the medical men were nervous about her, and was acted on by the desire of being an object of interest, so characteristic of some patients of this class. She had held her breath, or taken it so very softly as not to seem to breathe at all. The fact that the colour of the lips had improved, and that

the pulse had rallied and was going on with regularity were signs that the nitrous oxide had nearly left the system. The laughing and gesticulation formerly witnessed is now seldom seen, and when it happens to occur, we can generally account for it by the patient not having inhaled gas sufficiently pure. Until quite recently it was given by means of a bladder and small tube, through which the patient breathed backward and forward; the gas would thus be diluted with some eighty cubic inches or more of residual air in the lungs, and a further dilution would be likely to occur through an involuntary or voluntary effort on the patient's part to obtain air. Every practical chemist is aware of the difficulty of making this gas, owing to the liability of the glass retort to fracture, and to the over-heating of the nitrate of ammonia and the formation of the higher oxides of nitrogen. Mr. C. Fox has for some time past made the gas which I use. He finds great advantage in making large quantities at a time, and in using a glass retort nine inches in diameter; this is enclosed in a wooden case lined with tin, and with a glass door, by which means a uniform temperature is more easily kept up. Made in this way, the process of washing the gas is scarcely necessary, although adopted as a matter of caution.

Physiological Action.—It appears to produce its anæsthetic effects by preventing the oxidation of the nervous centres, and this chiefly by depriving the blood of its supply of free oxygen. Although there is more oxygen in nitrous oxide than in air, it is chemically combined with nitrogen, whereas air is a mixture of nitrogen with free oxygen. The effect of a moderate quantity of nitrous oxide, so long as the influence of the atmospheric air last inhaled remains, is exciting, but as soon as the oxygenating property of the blood is lost, the functions of the nervous system fail, and if fresh air be not quickly supplied they cease, and the animal dies.

But although the inhalation of this gas deprives the blood of oxygen in an available form, it does not prevent the escape of carbonic acid, for if the expired gas is passed over lime water, or over hydrate of lime, as in Mr. Colman's apparatus, the lime is found to have taken it up, and to be converted into carbonate of

lime. A further confirmation of this is afforded in contrasting the effect of inhaling the same gas again and again from a bladder of small size. In this case the anæsthesia approaches slowly, is accompanied by excitement, and there is more or less headache complained of afterwards, which rarely or never occurs from breathing pure nitrous oxide.

The functions of the brain proper cease before those of the medulla oblongata, hence we have loss of consciousness before the respiration fails; and the functions of the medulla are abolished before those of the ganglia presiding over the heart, and hence failing respiration occurs before failure of the heart's action.

Only one death is known to have occurred within an hour of inhaling the gas. This case was one of extensive phthisis, and it has been supposed from this case, and from the lividity induced by the gas, that persons with delicate lungs are not fit subjects for taking it. If extensive disease of the lung exists it would be imprudent to use it in the present state of our knowledge, but I have given it where I have believed only a moderate lung disease existed, and observed that in these cases no untoward symptoms were produced. Persons liable to syncope would seem to be very bad subjects, since the occurrence of it at a time when respiration was failing would probably be fatal.

I have known no signs of mischief to the brain follow the inhalation. I have given it successfully to two persons who were the subjects of epilepsy.

The danger of death from blood getting into the trachea would be as great or greater than when chloroform is given. The patient would unfortunately show no signs of it, as the lividity which *might* tell of it, would, of course, not be distinguishable from that of nitrous oxide.

From all that I have seen of the administration of anæsthetics, and from the accounts published of the cases where they have been followed by a fatal result, it appears to me of little importance what is the age, temperament, or disease of the patient in estimating the danger of using them. The young and old, feeble and strong, fat and thin subjects, have all on some few occasions died from them. On the other hand, we have witnessed

the successful administration of chloroform, &c., in the advanced state of phthisis, heart disease, &c. The only reasonable hope of security lies in carefully preventing an overpowering dose, or the prolonged exhibition of a milder one, after symptoms of failing lungs or heart have shown themselves.

MANCHESTER ROYAL INFIRMARY

SULPHUR.

External Application.—Powdered sulphur dusted on the skin produces no change in it, but if mixed with lard or other unctuous substances, and especially when its application is accompanied with friction, it excites a slight degree of inflammation, on which account sulphur ointment has been applied to indolent sores to produce in them a healthier and more healing condition. As other ointments are more efficient for such a purpose, sulphur ointment is now almost solely used as a remedy for itch. In this complaint the object is to destroy the insect (*acarus scabiei*) and its ova, for it is on the presence of this animal that the disease depends. From a knowledge of their habits we can learn the circumstances best calculated to destroy them. The female, as soon as impregnated, burrows obliquely under the skin, and day by day deposits her eggs till she dies. The male remains a wanderer on the surface, and can be easily reached and killed by the ointment. To reach and destroy the female and her eggs, it is necessary to break up the burrows in which these are concealed, and to lay them bare to the action of the sulphur ointment. The destruction of the burrows can be easily accomplished by the liberal use of soap and water, by which the superficial and dead cuticle is removed, and the animal exposed.

Various methods of treatment are in use, but it is sufficient here to mention a few only.

M. Hardy claims for his method the power to cure in four hours. He orders the body to be first subjected for half an hour to a friction of soft soap; this cleanses the skin and lays bare the burrows. Then follows a warm-bath of an hour's duration, during which the skin is thoroughly well rubbed to complete

the destruction of the burrows. After this, the surface to be well rubbed all over, except the head and face, unless in the rare instances when these parts are attacked, by an ointment composed of two parts of sulphur, one of carbonate of potash, and eight of lard. One such course effects a cure.

This treatment is rather a severe one, and it not unfrequently irritates, inflames, and chaps the skin. To delicate skins such a method, therefore, is inapplicable, and still more so if there be much eczema or inflammation present, both of which would be undoubtedly much aggravated by such strong applications.

It is often sufficient to subject only certain parts of the body where the rash is seen to this treatment, and to apply the ointment to other parts in a milder manner.

If the skin be delicate or much irritated and inflamed, then a mild soap may be substituted for soft soap, that is one which contains but a small quantity of alkali, and an ointment without any alkali, and with perhaps less sulphur, may be substituted for that mentioned above, while the time of the applications may be shortened, and several washings and inunctions, repeated on successive nights, may replace the one severe application. The ointment should then be left on all night.

In most instances the simple ointment of the Pharmacopœia is sufficient, and, as this contains no potash or other alkali, it is but little irritating to the skin. If this ointment be chosen the patient should be directed to take each night a warm-bath, and to rub the skin with soap, bland or strong, according to the condition of the skin. After the body has been wiped thoroughly dry, the ointment is to be well applied to the skin before a fire, after which the patient is to retire to bed, and the ointment must be washed off on the following morning. Usually in three days the patient is cured.

On some occasions, the irritation set up by the parasite and its eggs excites more or less of eczema and impetigo, in which case the above treatment, although it would remove the itch, would certainly aggravate the accompanying eruptions. To avoid this a milder ointment, and of a different composition, is recommended by Hebra, namely, the following: of chalk 4 oz.,

of sulphur and prepared tar each 6 oz., of common soap and lard of each a pound. In this preparation the different constituents serve a different purpose. The chalk helps mechanically to remove the dead cuticle and to break up the burrows. The tar serves a double purpose, it dilutes the sulphur and acts beneficially on the eczema, while the soap and lard also further effect the dilution of the sulphur, and the former, from the alkali it contains, checks the weeping from the red, raw eczematous eruption. The application of this ointment is accompanied with the use of the warm-bath, and is employed twice in the day. In three days the cure is complete.

It often happens that even the mildest ointments excite and increase the eczema, and other eruptions produced by the scabies, even after the latter disease is removed. It is thus inadvisable to continue the use of such ointments for many days, or otherwise they may perpetuate the disease, and on withholding this treatment the rashes will frequently at once disappear. After these applications have been discontinued it is necessary for the patient to have an entire change of linen, and those removed should either be boiled in water, or heated in an oven, at a temperature above 212° Fahr., if the clothes are of such a nature as to be injured by hot water. By these means those animals or their ova, which may be concealed in the texture of the linen, will be destroyed.

It has been maintained by many that the sulphur of the ointment plays no part in the destruction of the animals and their eggs, but that this is effected by the fatty matters, which by obstructing their breathing-pores, suffocate, and so destroy them. This opinion appears to be erroneous, a sulphur ointment being far more effectual in the removal of the disease than a simple fatty one.

The ointment need not, except in rare cases, be applied to the head and face, as such parts are not often in this country affected with the disease. The disagreeable smell of the ointment may be in part concealed by the addition of some otto of roses or other agreeable smelling substance.

Some young women, in whom the menstrual flow is dis-

ordered, have their complexions spoiled by the appearance in the skin of the face of numerous small elevations or pimples, scarcely or not at all reddened, while the skin at the same time loses its healthy transparency. Sometimes on the summit of the elevation a minute pustule forms. This may be a form of acne, but is unlike that most commonly seen. The eruption sometimes appears without any disturbance of the menstrual functions, and may, at the menstrual period, almost disappear, but when the discharge has ceased, returns again. This complaint may last months, or even years, much of course to the annoyance of the patient. Such an eruption will very generally yield to the application twice or three times daily of the following lotion:— Sulphur, a drachm; glycerine, an ounce; water, half a pint. By this lotion patients are speedily benefited in whom the disease has continued for years uninfluenced by other treatment. Acne may be treated in the same way.

Action of Sulphur in the Mouth, &c.—As it is quite insoluble in any of the fluids of this cavity, it possesses no taste; as, however, it often contains a small quantity of either sulphurous acid or of a sulphide, it may have the flavour of these substances. In the stomach it suffers no change, and in no way affects the mucous membrane of this organ.

Such is not the case in the intestines. Here, in ordinary doses, sulphur causes rumblings, slight colicky pains, followed in a short time by a slight and softened evacuation, which may be soon repeated. From the occurrence of colic, and the condition of the motions (*i.e.*, their semi-solid state), it is generally held that sulphur is a purgative chiefly by its action on the muscular coat of the intestines, exciting these to contraction, and acts less on the mucous membrane. From the mildness of its operation it is ranked among the laxatives. The precipitated sulphur is more finely divided than the sublimed, from which property it acts as a purgative more surely and effectually of the two.

If its use be long continued, it excites a catarrhal state in the mucous membrane, and impairs digestion.

It must be borne in mind, in the employment of this remedy, that it is chiefly an evacuant of the intestines, and by the little

increase in the secretion of the mucous membrane it is not an evacuant of the general system.

It is used where a mild purgative is required and it is desired to maintain the motions in a soft and yielding state, as in piles and fissure of the anus, that these parts may not be irritated and put to pain by hard unyielding stools. It is also employed in stricture of the rectum and in habitual constipation.

It is supposed by many, among whom was reckoned Graves, of Dublin, that this remedy had a beneficial action on the rectum in prolapsus and in piles, apart from its power to soften the motions, and is often employed, the author thinks, with benefit in these troublesome diseases.

It will now be considered what changes the sulphur suffers, and in what way does it act as a purgative in the intestines.

Some of the sulphur, it has been thought, is dissolved in the fat it meets, and by its solution it is enabled to act as a purgative as well as pass into the blood. This explanation of its action and absorption is made improbable by the fact that when sulphur is administered, if much fat is taken, the quantity of sulphur in the urine is not increased.

The above question receives its most satisfactory answer in the fact that some of the sulphur undoubtedly is converted into a sulphide by the action of the alkali of the bile. Such a conversion is shown by the occurrence, in those persons who take sulphur, of flatulency, and the gas generated in the intestines contains much sulphuretted hydrogen, while at the same time much of this gas is given off by the skin, and so tarnishes any metal articles of dress which it meets.

By conversion into a sulphide, sulphur acts as a purgative, and by the same change it is enabled to enter the blood.

This view is supported by the fact that sulphides act in the same way as sulphur.

Of its passage into the blood we have already in part spoken, when it was stated that some found its way into this fluid as a sulphide. Yet some probably passes through the walls of the intestines undissolved, and in form of fine particles, but the quantity so conveyed is undoubtedly very small.

Influence on the Blood and Organs of the Body.—Its action on the physical or chemical constitution of the blood is at present unknown. It is stated by some to have occasionally produced salivation in persons who had previously taken mercury. It is generally considered to excite an increased secretion from the mucous membrane of the air passage in healthy persons, although this is denied by Buckheim. By Graves, and other great authorities, it is most strongly recommended in doses of five to ten grains, repeated three or four times a day, for persons affected with severe chronic bronchitis, with abundant discharge, especially when this is accompanied by constitutional debility. It is stated to lessen the secretion and to make its expulsion easier.

It has also been said to increase both the frequency and force of the heart's contractions, and also to promote the flow of perspiration from the skin; but both these assertions greatly need confirmation.

From the above supposed action on the skin, it has been employed in the treatment of gout and chronic rheumatism.

Chronic eruptions of the skin of the dartrous family, as acne, psoriasis, impetigo, and eczema, are said to be influenced for good by the internal administration of this remedy.

Elimination of Sulphur.—Most of that carried into the stomach escapes through the intestines with the fæces; while part of that which enters the blood becomes oxidized, and appears in the urine as a sulphate, or one of the lower oxides of sulphur. The sulphuretted hydrogen, from its great volatility, escapes in some measure by the lungs and skin, and occasionally with the milk, and by the urine.

It has been asserted that some of the ingested sulphur passes through the system, and is separated by the kidneys in the uncombined state.

This substance produces no change in the quantity of the constituents of the urine, with the exception of the sulphur compounds, which it augments.

SULPHIDE OF POTASSIUM.
„ SODIUM.
„ AMMONIUM.
„ CALCIUM.

Sulphide of Potassium is chiefly used as an external application, and is administered in the form of a bath. The remaining members of this group, as natural waters, are used in a similar manner.

In concentrated solutions, the first three substances cause active inflammation of the skin, but are never used for such a purpose. When more diluted, they all have a powerful action on the skin, which by their use is much reddened, and its perspiration much increased.

They may be employed as baths with very considerable benefit in many chronic skin diseases, such as psoriasis, eczema, lichen, &c., and have sometimes accomplished a cure when other remedies have failed.

Used in the same way, namely, as baths, they are very useful in chronic rheumatism, chronic gout, and chronic lead-poisoning.

In explanation of the good such baths often accomplish in persons with chronic lead poisoning, it has been assumed that they produce an elimination of the lead with the sweat; and in support of this supposition, it is said the skin of such persons becomes, when they use these baths, covered with innumerable black points of sulphide of lead. It may be objected to this argument, that the lead which is thus blackened is deposited on the skin from without, and is not eliminated with the perspiration. But this objection is met by the assertion, that if these people carefully abstain from all contact with lead, their body still becomes blackened, time after time, as often as they may use a sulphureous bath.

It is, as we shall see, when speaking of lead, difficult, on theoretical grounds, to understand how this metal can be separated through the skin with the perspiration; but for the further consideration of this point, we must refer our readers to the section on Lead.

Sulphuretted hydrogen gas is destructive of lice, and it is supposed that sulphur accomplishes the death of the itch insect, when employed in the treatment of itch, by being in part converted into this gas.

Persons, whose joints are much distorted and stiffened by chronic rheumatoid arthritis, may have much of their suppleness restored to them by the use of these baths at a very high temperature. But as other baths, of an equally high temperature, appear to be equally good, it is difficult to learn whether the sulphides have, in this instance, any part in the good results.

A very efficient application for the itch is made in the following way :—Boil one part of quicklime with two of sublimed sulphur in ten parts of water until the sulphur and lime combine.

The solution should be allowed to stand, and then be decanted, and metal vessels should not be used in its preparation.

The liquid solution is to be painted over the body after it has been well cleaned by a bath, and wiped quite dry.

This application is rather irritating, and sometimes produces a roughness of the skin, which may continue some time after the application has been discontinued.

This treatment was introduced by Dr. Bourguignon, who claims by it to cure the patient in half an hour.

Mouth.—In the mouth they have a disagreeable taste of rotten eggs. These substances are not employed as topical remedies to any disease of this cavity.

In the stomach they are in part decomposed by the acids they meet there, and, after their employment, disagreeable eructations of sulphuretted hydrogen gas often occur.

In small doses, they excite a feeling of warmth at the epi-

gastrium, but in large ones, they produce very active inflammation of the digestive canal, with its customary symptoms.

Small doses act as slight irritants to the intestines, and determine slight relaxation of the bowels. It is supposed that sulphur acts as a purgative, by being first converted, through the agency of the alkali of the bile, into a sulphide.

These substances have been recommended, and employed in cases of poisoning, by many metallic salts. They precipitate the metal in the form of an insoluble sulphide, and so render it harmless.

There is, however, danger that the sulphide may be given in too large a quantity, when it would itself excite much inflammation of the stomach, and hence sulphide of iron is often recommended as superior to the alkaline sulphides in most instances.

Their effect on the blood after their absorption into that fluid is at present unknown.

Persons who habitually breathe this gas certainly suffer from great anæmia, and the gas appears to cause much depression of the functions of the body.

It has been said that they produce, when taken by the stomach, insensibility and speedy death. But it has been doubted whether this result be not due to the effect of these substances on the stomach, and not from their absorption into the blood and conveyance to the nervous centres. For, from Bernard's experiments, it appears the sulphuretted hydrogen injected into a vein is so quickly eliminated by the lungs, that the arterial blood is quite free from this gas, and consequently the nervous centres cannot be affected by it.

When inhaled, sulphuretted hydrogen is a deadly poison.

These substances may be very usefully employed in certain troublesome diseases, and then often yield very striking results.

Thus, when taken by the stomach, they have the power to promote suppuration. Their first effect on a sore is to increase its suppuration, and then subsequently to dry it up and promote its healing.

Abscesses, according to the degree of their development,

appear to be differently affected by these salts. In their very early stage they may be dispersed, but when matter is formed they greatly accelerate the maturation of the abscess, and promote the expulsion of the pus. But it is most important also to remember, that at the same time they do not increase the inflammation. Nay, this, under their influence, often appears to become more circumscribed. They seem to promote elimination of the matter, but to check the inflammation around it. Their power thus to influence abscesses and boils may be abundantly proved by those who will administer these salts in such complaints.

In scrofulous and tuberculous glands they considerably augment the suppuration and expulsion of the diseased products, and thus greatly reduce the deformities in the neck of persons with these diseases. Where the discharge from any sore is scanty, thin, and sanious, these medicines make it thick, creamy, and healthy-looking, and at first abundant.

These salts are of extreme use in onychia.

Their good effects, however, are most conspicuous on the scrofulous sores of the following kind, often seen in children. In scrofulous children, during the first few months of life, there not uncommonly occur indolent abscesses, which run a very slow, inactive course. They form in the cellular tissue. At first there is but a small, hard substance, no larger than a pea, under the skin, which is moveable over it, and of its natural colour. These small substances gradually enlarge. The skin becomes adherent to them, and is changed to red, or even violet in colour ; while often in their neighbourhood the smaller vessels are enlarged, and even varicose. They may grow to the size of a florin, and, when maturated, feel soft and boggy. After a time, a small circular opening, perhaps not larger than a pin's head, is effected, through which escapes a thin, unhealthy pus. If deep-seated, as on the buttocks, or in fat children, there may be no discoloration of the skin, or very little. The chief noticeable character, then, is the small, sharply-cut opening, as if a piece had been punched out. These formations follow one another; some are small, others of considerable size, and they may continue to distress the child for

months or years. At the same time, it often happens that the fingers, hands, and, it may be, the toes are affected. The fingers, especially about the joints, are much swollen, and become nodose. The skin over them is red, tense, and glazed, and at various places there are rather sunken openings, through which a very unhealthy pus escapes. Large indolent abscesses may form on the back of the hand, and contain a very watery matter. The bones of these parts are sometimes diseased.

This most troublesome affection is most admirably treated with these medicines.

Many of the abscesses, especially if in a very early stage of their development, dry up and disperse. Others are speedily brought forward, their contents discharged, and the sore made a healthy and a healing one. Their effects on the deformed fingers are most striking. At first the discharge is much increased, and is made at the same time creamy and healthy-looking. Then in a week or two the discharge grows very much less, the fingers reduce in size, and gradually assume their proper proportions, while the sores gradually heal. As all this is in progress, the health of the child very greatly improves, although previously it was failing, in spite of the administration of cod-liver oil and steel wine.

That the improvement is due to the sulphide is fully shown by the fact that it occurs when this alone is administered. Indeed, in the author's experience, it is better at first to give this remedy by itself.

It will be noticed, moreover, that after the sulphide is commenced, no new abscesses appear, although the child has not been free from them previously for many months, or even years.

Those very hard and large swellings, which sometimes form in the neck of children, behind the jaws from an inflamed throat, as of scarlet fever and measles, may be admirably treated by this remedy. The abscess is in these cases very slow to progress, and causes the child much trouble and suffering. If matter be formed, its expulsion may be much hastened by these remedies.

The following is the strength adopted by the author:—He orders a solution which has much the strength of the Harrogate

waters. Thus he directs a grain of the sulphide of calcium (the member of this group which he always employs) to be dissolved in a half a pint of water, and of this a teaspoonful is taken every hour.

One circumstance should be mentioned and must be alluded to, which is this,—the salt when dissolved rapidly becomes oxidized and changed into a sulphate, and, in a very short time, none of the sulphide remains, consequently it is very necessary the medicine should be taken while it is fresh. It should be compounded every day.

Before the remarks on this subject are concluded, it will not be amiss to mention, that in employing these sulphides in baths, porcelain or wooden vessels must be used, as the sulphides attack most metals and discolour them. These baths have a most offensive and powerful smell.

CHLORINE GAS.
CHLORINE WATER.
CHLORINATED SODA
CHLORINATED LIME } **and their solutions.**

These substances are used as deodorizers, disinfectants, and antiseptics.

Whatever powers they possess in these respects is due either to their chlorine or to the hypochlorous acid, which is abundantly given off by the two latter members of this group.

Their way of acting is probably the following:—Chlorine gas has very strong chemical affinities, and takes with avidity hydrogen from many organic and inorganic substances, which are then destroyed.

Hypochlorous acid is an active oxidizing agent, as it yields up its oxygen and so destroys many substances; at the same time chlorine gas is set free, which again acts in the way described.

In this manner these substances act as deodorizers, destroying the ammonias, sulphuretted hydrogen, and sulphides of ammonia, on which the disagreeable smells of sick rooms depend.

Chlorine is admirably suited as a deodorizer, as from its gaseous state it penetrates every corner of the room, searching out and destroying the noxious and offensive gases.

While these substances may be conveniently and most profitably used as deodorizers, it must always be borne in mind, that it is preferable to prevent bad smells by free ventilation, and that the chlorine gas itself has a disagreeable smell which is very offensive to most people. If such deodorizers be often required in a sick room, it is a sure sign that ventilation is deficient, and probably that the nurse is careless.

These substances are employed as disinfectants, but the evidence in favour of their possessing such a property is very deficient.

It is true some infecting matters, when treated with these substances, lose their power to propagate disease, but it is impossible to subject either persons or things, without destroying them, to such a powerful action as was found to be required.

This statement makes it not the less desirable to fumigate rooms which have shortly before been occupied by sick people, as it can do no harm, while the opinion concerning its good influence, when thus employed, although not scientifically proved, is a very generally received one.

Solutions of these substances are, according to the strength in which they are applied, stimulating or irritating to the skin. Where, therefore, we have a foul-smelling and sloughing sore, and when it is desired both to remove the disagreeable smell as well as stimulate the tissues into a healthier action, these solutions may most advantageously be used.

They find a very large employment for this double purpose, but at the present time permanganate of potash is more preferred.

Solutions of this latter salt, undoubtedly as completely remove the smell of putrid sores as the solutions of this group, and have the advantage over them of being free from smell.

But the author thinks the preference should be given to the chlorine solutions, as they are stimulating, which is not the case in any great degree with the permanganate of potash. Hence this

group are more calculated to do good by altering the character of the sore, and so permanently removing the smell.

These solutions find employment after operations, especially if hollows are left in which pus can accumulate and decompose; when such is the case, the pus and putrid matter must not be permitted to collect and decompose, but as soon as a disagreeable smell is noticed, the cavity must be thoroughly cleansed with deodorizing solutions.

After parturition, in puerperal peritonitis, or if at other times the uterus contains decomposing substances, this cavity must be carefully and frequently washed. In empyema, after the chest is opened spontaneously or artificially, the putrefaction of the contained pus must be prevented by washing with these deodorizing substances. In sloughing of the throat, as of scarlet fever or diphtheria, and in salivation, and ulceration of the mouth, the smell and putrefaction must be removed by washing with similar solutions.

If a stimulant action is required, then the chlorine solutions are to be preferred, but if a blander application is desired, then permanganate of potash should be employed.

IODINE.

Iodine is possessed of powerful chemical affinities, and combines with energy with many organic and inorganic substances.

It is volatile, and can penetrate with readiness the animal textures.

Action on the Skin.—To the skin it may be applied for a variety of purposes. In the form of liniment, it is frequently used as a rubefacient and counter-irritant. When applied, it at first produces a feeling of heat and burning, which may increase to such an extent as to be unendurable. By the inflammation it excites, the cuticle is separated to a greater or less extent from the dermes beneath. This may be so slight, that mere desquamation in a few days occurs, or, if the liniment be a strong one, be so severe, that a blister, containing serum with much fibrin is

rapidly produced. If applied in such strength as to produce this last-named condition, a permanent scar is left, an occurrence which it need not be said should be most carefully avoided.

Two coats of the pharmacopœia liniment should be painted on the skin, and will generally be easily borne by the patient.

If, as sometimes happens, great pain arises, it may generally be quickly relieved by a poultice, or by washing the part with a little spirit, such as whisky or gin, which are very generally at hand. After this application, there may arise in and around the spot a crop of itching papules.

The liniment may be applied to the chest as a counter-irritant in chronic pleurisy, to promote the absorption of the fluid accumulated in the pleura. Or under the clavicles in the chronic forms of phthisis, to allay harassing cough, and to check secretion from the bronchial tubes and cavities of the lungs. It may also be painted on any part of the chest which is troubled with pleurodynic pains, although for this last purpose a mustard poultice is to be preferred, as it can again in a short time be resorted to if the pain return. The iodine may succeed where the mustard poultice fails. It is painted around joints affected with chronic rheumatism or chronic gout, or with chronic synovitis. Like blisters, it eases the pain, and often removes the fluid with which the cavity of the joint is distended. Like blisters, it often causes the distension of the joint to be increased for a few days, and its good effects do not become apparent till later. Such an increase in the swelling may be regarded as favourable, and as an indication of the success of the application. The liniment or tincture is recommended as a local application to lupus; it must be painted not only on the edges of the sore, but also over the tissues around. It is stated by this application, the spreading of the disease is arrested. In the form of ointment its application is various. It will be found of the greatest benefit in chilblains. The ointment should be well rubbed over the affected part before the skin is broken. The tincture lightly painted over the part may be substituted for the ointment, and it will rarely happen for either of these applications to fail of its purpose.

The ointment is often useful in removing some of the non-

inflammatory pains of the chest. These, however, are not always of the same nature, and hence discrimination must be exercised in the employment of this ointment. When the pain is situated in the muscles (myalgia), and when these are tender on pressure, while the skin may be pinched without pain, this ointment is indicated. But if the tenderness is situated in the skin (pleurodynia), belladonna is to be preferred. The author believes Dr. Hare first pointed out this distinction.

Such appears to be the general, but not the universal rule, as exceptions to the above statements occur.

Both the ointment and liniment of iodine are used for the same purposes; but it must always be recollected the ointment is much the milder preparation of the two, and will produce only a small amount of desquamation after it has been several times applied.

The tincture or the ointment is often applied to the skin over indurated swollen glands, or over parts thickened by inflammation, with the hope the diseased products may be the more quickly and thoroughly removed, and the natural condition of the parts restored to them. As an external application, iodine mixed with oil of tar in the proportion of two drachms of the former, to an ounce of the latter has been introduced by Dr. Hillier, as an efficient application against tinea tonsurans. This application produces no pain, and without doubt prevents the extension of this troublesome disease.

As an irritant, the liniment, ointment, or tincture are each sufficient to remove herps circinatus. The first should be applied but once, the latter once or twice a day.

Iodine in solution is often injected into the serous cavity surrounding the testicle when this is afflicted with hydrocele. The serous fluid is first drawn off, when some solution of iodine is injected into the cavity, which excites in the parts over which it flows adhesive inflammation, so that the contiguous parts of the sac become united, and the effusion of a fresh quantity of serum is rendered impossible; the part should be as little irritated and pressed as possible, otherwise much pain is inflicted on the patient.

The idea expressed in this treatment has been applied to other diseases.

It has been recommended to inject tincture of iodine, or iodine solution into joints affected with white swelling, into the cavity of the pleura in pyæmia, into ovarian tumours after tapping, and into large abscesses, after they have been opened, and their contents let out.

The accounts of the cases thus treated are most satisfactory, and if the testimony of its advocates be not overdrawn, it is surprising that this treatment is not more widely employed.

It is said, when employed in the treatment of white swellings, to produce no disagreeable symptoms, and generally to prove beneficial, unless there be caries or necrosis of the bones or swelling of the surrounding parts.

In chronic pleurisy, after the side has been evacuated, iodine injections remove the great fetor which is often present from the decomposition of the pus in the pleural sac, and also diminish the secretion from its walls. The injection must be at first weak, as four or five grains of iodine and iodide of potassium to a pint of water. When the structures have become accustomed to the injection, a stronger solution may be employed. Although no doubt such treatment may often be adopted with much success, still it must be used with the greatest caution, or otherwise much inflammation, with high fever, will result, circumstances which in many instances have proved fatal to the patient.

It is desirable to first wash out the pleural sac with a small quantity of a weak solution of iodine, and see how this is borne. If the result is a satisfactory one, stronger and larger injections can be employed.

Milder injections such as those containing Condy's fluid, or a small quantity of creosote, are sometimes all that is required, and if these succeed in removing the fetor from the pus, the more powerful application need not be employed. It is of the highest importance to keep the sac free from foul gases and putrid pus, as most of the wasting with loss of appetite and depression in such cases can be traced to the absorption of poisonous gases and putrid fluids. To secure their removal, in

addition to the injections just mentioned, or even sometimes without them, the method lately employed by Mr. Berkeley Hill with much success may be adopted. By this the fluid in the cavity is drawn off once or twice a day by means of a catheter.

The chest walls soon sink in, and the lungs more or less expand, till their parts come in contact and unite, and so obliterate the cavity of the pleura, and prevent the further accumulation of matter.

Iodine injections often prove most serviceable when injected into the cavities of large abscesses after their contents have been discharged. The tincture itself may in such cases be used, and in good quantity. At the same time the cavity of the abscess should be kept clean and sweet by frequent washings with small quantities of a weak solution of Condy's fluid.

Iliac and lumbar abscess may be treated in this way.

As an inhalation, the tincture of iodine may often be used with the most signal benefit. The following are the diseases in which this application will be found useful.

In the chronic forms of phthisis (fibroid lung), when the expectoration is abundant, and the cough troublesome, the inhalation used night and morning will generally lessen the expectoration, and allay the cough.

Such an inhalation is also of very great service in cases of the following kind:—

Children, six to ten years of age, after measles, or it may be without any such disease to cause it, are on exposure to cold seized with hoarseness, a hoarse hollow cough, and some wheezing at the chest. The parts affected appear to be the larynx, trachea, and larger bronchial tubes. This affection often proves very obstinate, and lasts a considerable time. Moreover, they are very prone to be affected by it on the slightest exposure, or to have an attack, already mending, aggravated and greatly prolonged. Such a disease may very generally be removed, and the returns prevented by iodine inhalations.

There is still another affection of the respiratory passages which yields easily to these inhalations. Patients of various

ages, and for many years are greatly troubled with attacks repeated daily, and lasting, it may be several hours, of sneezing, running at the nose of a watery fluid, weeping of the eyes, and severe frontal headache. Such an affection is often at once removed by iodine inhalations, and should it return, may be again restrained by a repetition of the inhalation.

In the administration of the inhalation, the author adopts the following plan as being simple, handy, and clean:—He directs a jug, capable of holding about two pints of water, to be well heated by rinsing it out with boiling water. After this, it is again to be partially filled with boiling water, on which twenty or thirty drops of the tincture of iodine are poured, and then the patient is directed to put his face over the mouth of the jug and thus to breathe the steam and some of the iodine.

To prevent the escape of the steam, it is desirable that both the jug and head of the patient be covered over with a towel.

This inhalation should be used night and morning, for five minutes, or a little longer, if the water has not cooled.

If too much iodine be used, there occurs with some people a feeling of soreness in the chest and throat, with sometimes redness of the conjunctiva, with running at the nose and pain in the head.

The inhalation is sometimes employed in chronic bronchitis; but the author thinks without much benefit.

The tincture may be employed with benefit to remove the tartar from the teeth, and to act as a stimulant to the gums when these are receding, leaving the teeth exposed to become decayed. It should be painted over the gums close to the teeth.

An iodine gargle, made with two to four drachms of the tincture to eight ounces of water, has been recommended as useful in mercurial salivation, and the tincture of iodine has been applied to sores of the throat, syphilitic and simple, with supposed superior benefit to other stimulating applications.

In the stomach, this substance, if taken in any quantity, acts as an irritant and excites inflammation in the delicate structures of this part, in consequence of which there occurs pain at the epigastrium, vomiting, with diarrhœa, and sometimes much col-

lapse, and even death. When administered, it should be given soon after a meal, when the mucous membrane is protected by the food contained in the stomach.

When this substance reaches the stomach or intestines, and certainly when it enters the blood, theory would suggest that the iodine can no longer remain uncombined, but must be converted into either an iodide of potash, or, more probably, of soda, and henceforth, in its career through the body, its effects will be that of an iodide, and its history will be traced when we speak of these salts. Practically, there is much to confirm this view, as the action of iodine is admitted very generally to be the same as the iodides on the distant organs of the body. Yet some practical authorities have stated, that in chronic rheumatic arthritis, good may be obtained by the use of the tincture of iodine when the disease has remained unaffected by iodide of potassium. It is certainly difficult to understand how this should be.

Iodine inhalations have been found in some epidemics of diphtheria, of very great service.

The following mixture has been recommended by Dr. Waring-Curran:—4 grains of iodine, 4 grains of iodide of potassium, 4 drachms of alcohol, and 4 ounces of water. Of this a teaspoonful should be added to boiling water, and the steam from this is inhaled. The water should be kept hot by a spirit-lamp placed under the apparatus. As the patient becomes accustomed to the iodine, the quantity of the solution may be increased till half an ounce of it is employed at each inhalation. The application should be repeated many times a day, and each inhalation must be continued for 8 to 12 minutes.

Iodine may be used in the following simple way as a deodorizer and disinfectant in contagious diseases as small-pox and the like. A few grains are placed in a chip-box or saucer, and thus suspended over the patient's bed.

IODIDE OF POTASSIUM.

As this is an extremely soluble salt, and is also possessed of a very high diffusion power, it finds a ready entrance into the

blood, and is as speedily eliminated from it with the secretions of the body.

Action on Skin.—As an external application, it formerly enjoyed more favour than it at present possesses. By many medical men it is applied to the skin as an ointment over enlarged glands, or parts thickened with inflammatory products, with the hope and expectation of restoring to the tissues their natural state. It is thought the iodide of this ointment is, by the employment of friction, absorbed by the skin, and so operates directly on the diseased structures beneath. It is doubtful if the salt thus applied, acts as beneficially as when given by the mouth.

The ointment of this salt, or of iodine, is often applied over the thyroid gland when it is affected with bronchocele. The ointment, containing uncombined iodine, is an irritant to the skin, and may, in virtue of this action, prove useful in this disease.

Mouth.—It has a saltish taste.

According to most authorities, the iodide produces, probably after its absorption into the blood, decided changes in the mucous membrane of the mouth. It causes redness and injection of the lining of the cheek, the throat, soft palate, and of the tongue, and an increased growth and separation of the cuticle covering these parts. At the same time, there is said to occur an increased flow of saliva. Such appearances are certainly often absent after very large doses of the medicine, and even when severe iodism is produced.

The salt is not employed as a local application in any disease of the mouth.

Stomach.—In the stomach, after a large dose, it is an irritant, and disorders digestion. Some persons are much more prone to be thus affected than others, and so great is this difference in individuals, that even small medicinal doses are sometimes observed to irritate the stomach.

The salt, in common with chloride of sodium, and chloride of ammonium, can increase the production of mucus from the stomach and intestines, as well as from the mucous membrane of other parts of the body. When such a result is desired, we resort to the chloride of ammonium in preference to the salt.

From its great diffusion power, it passes with great quickness from the stomach into the blood, and very speedily reappears in the urine. But small quantities, therefore, pass into the intestines, and it is only when taken in very large doses that it can purge; it is, therefore, never employed for this purpose.

It is probable that the iodide of potassium, when it comes in contact, either in the stomach or the blood, with chloride of sodium, changes its base and becomes iodide of sodium.

In the Blood.—We know but little at present what physical or chemical changes it produces in this fluid, neither do we know much regarding the alterations it works in the organs to which it is carried.

If its administration be continued for a long time, or if there be, on the part of the person who takes it, great susceptibility to its action, we obtain what is termed iodism.

It must, however, be mentioned, that many persons can take this drug for an almost indefinite time, or in very large quantities at once, and yet not present the symptom which constitutes iodism, while others suffer from these effects, even after very small doses of the salt.

Neither are all the symptoms met with in every instance when iodism is present, for sometimes those affecting one tract of the body are well pronounced, while others which affect another and distant part, are altogether absent.

The tissues most frequently and most severely influenced by this drug when iodism occurs, are the mucous covering of the eyes and lining of the nose, frontal sinus, and mouth with the skin of the face. There is first noticed some slight running at the nose, with occasional sneezing, and a little frontal headache; these symptoms become more marked when the conjunctiva of the eyes is injected, and the tears abundantly flow. The loose tissues about the orbit become swollen, reddened, and œdematous, while occasionally a peculiar rash appears on the skin of the face. This is at first noticed around the eyes, after which it attacks the nose and its neighbouring parts, and then the chin. The parts in the order in which they are here stated are most severely affected by it.

The nose is sometimes reddened, especially at the tip, and is at the same time rather swollen. The rash has not always the same look. It is often very much like acne, and is always hard, shotty, and indurated, but the papules may be broad and large, and covered with what looks like a half-developed vesicle or pustule. The changes in the mouth have already been mentioned, when speaking of the influence of this medicine on that part.

With some persons, the stomach is at the same time deranged, although in the author's experience this organ often escapes when the face is affected; while, on the other hand, there are persons who suffer in the stomach when they take this remedy, and who are not affected in the nose or eyes. When the stomach is chosen out by the iodide, there occurs nausea, and a feeling of sinking at the epigastrium, with loss of appetite, and sometimes watery diarrhœa. Very small doses may thus affect the stomach. With some persons, it produces most distressing depression of both mind and body. If the use of the drug be discontinued on the occurrence of iodism, the symptoms just described very speedily disappear, and in the course of twenty-four to forty-eight hours, the rash on the face with the running at the eyes, &c., has very greatly declined.

By some it is maintained that persons who are very susceptible to these effects can have them prevented by taking with the iodide of potassium a full dose of carbonate of ammonia or spirits of ammonia. The author has many times put this recommendation to the test, but without any very decided results, although it has appeared to him, on some occasions, that the iodism was a little controlled when the ammonia was administered.

The iodide has been employed in a great variety of diseases; and although its application is now much more limited than formerly, it must still be regarded as one of the most valuable medicines we possess. It is largely employed in syphilis, but is not equally good in all forms of the disease. It is best employed in secondary and tertiary syphilis, and especially in the latter, where mercury often does harm. It should be employed in preference to mercury when the health is much broken, or when

this metal has previously been taken without good results, or when the bones are diseased. Its action is especially conspicuous for good when the disease fixes on the periosteum of the bones or fibrous structure of the softer organs, and forms what are called nodes. These are speedily affected by this drug. Their pain almost immediately leaves them, and if not of long standing, they soon disappear. Its action on this form of the disease is almost magical. By Dr. Neligan it is preferred to a salt of mercury in the treatment of tubercular syphilitic skin eruptions. It is also of very great service when the deep-seated and important organs are attacked by syphilis, and has been praised for its good influence on syphilitic iritis; but by most authorities on the latter disease mercury is much preferred. The secondary syphilis of children is best treated with mercury. Yet there occurs in children a few months or years old a syphilitic thickening of the periosteum, which is usually met with at the heads of several of the long bones, but sometimes affects the shafts also. The thickening is first felt around the bones; but as the disease advances, the soft tissues around them become infiltrated with a firm exudation, which may increase to such a degree that the part of the limb attacked is much swollen, the skin very tense and shining, and a little reddened. The affected parts are very painful.

When the disease is seated at the head of the bones, the movement in the joint is not impaired. This disease, if it remains long uncured, leaves permanent thickening and enlargement behind it, and so it sometimes happens that children with syphilitic teeth, and who are blind from syphilitic iritis, have the heads of several of the long bones considerably enlarged. This form of secondary syphilis—not a common one—is better treated by iodide of potassium than by mercury.

Other chronic periosteal thickening, not of a syphilitic character, may be treated with success with this remedy.

It has been recommended to use the iodide of potassium in mercurial salivation.

The author agrees with those observers who believe this affection of the mouth to be often aggravated by this remedy; and

yet while such is the case, it undoubtedly appears sometimes to do great good. The action of the iodide on the mercury in the system will throw much light on this question, and thus this matter will now be shortly discussed.

The mercury salts, like those of most other metals, forms with albuminous substance an insoluble compound. These compounds are very generally soluble in the chlorides, bromides, and iodides of the alkalies, but especially in the latter. Many of the metals, when conveyed into the blood, are deposited in an insoluble form in the animal structures, and amongst other metals, mercury and lead. Iodide of potassium is enabled to re-dissolve these two metals, and to bring them again into the circulation, and so again to subject the system to their influence. But iodide of potassium has the property to promote the separation of both mercury and lead by the urine, and thus to free the system of their pernicious effects. In the foregoing remarks, in which it has been said iodide of potassium has the property to dissolve mercury compounds of albumen in the body, and to bring them back into the circulation, we have an explanation of a well-known property of this salt, that, namely, of producing salivation in persons who previously have taken considerable quantities of mercury. Such being the case, it would be expected, if a patient had for some time taken mercury, and then became salivated, that iodide of potassium, if administered, would still further increase the ptyalism, and not check it. In other cases it might be different, for we have seen the salt promote, through the urine, the separation of this metal. In a case, therefore, where but little mercury has been taken, and for a short time only, but in which salivation has occurred, the iodide of potassium, by quickly separating the metal from the system, would ease it of its effects, and so assist to remove the salivation. If it should ultimately prove that the increased elimination is due to the mercury being brought back into the circulation, and so under the influence of the kidneys, and that the iodide does not promote the elimination of the metal in any other way, then its administration in mercurial salivation can only do harm, and aggravate the disease.

It has been said in our foregoing remarks, that this salt can produce of itself salivation. Some have ascribed this action to the power of the iodide to affect the mercury in the way just explained; others hold, even where no mercury is taken, the iodide of potassium has the power to increase, to a variable amount in different people, the salivary secretion.

From its power to eliminate, through the urine, lead from the system, this drug is usefully employed in lead-poisoning. Indeed, it stands unequalled as a remedy for this disease. It will be subsequently shown, when speaking of lead, how, through its power to eliminate this, it becomes useful in certain cases of gout. It is of most signal use in bronchocele, when the enlargement of the thyroid gland is due to hypertrophy, and not to cystic formations, or other diseases. If of the former character, under the influence of this drug the enlargement often very speedily diminishes, and usually it effects a perfect cure. With its internal employment the compound tincture or the liniment of iodine is very generally painted on the skin, over the swelling. Other indurations, or enlargements of the glands, such as of the mamma or testicle, have been treated with iodide of potassium, though with much less advantage than the disease just mentioned. It might be expected, from its action on the hypertrophied thyroid, that this remedy would be of corresponding use when similar hypertrophies occurred in other glands; but such does not appear to be the case, as chronic mammary tumours remain without change when treated with this remedy.

Inflammatory effusion, such as occurs in pleurisy, inflammatory thickening of organs, can be removed more quickly when this salt is administered. Sciatica and lumbago may be sometimes relieved by iodide of potassium, although very often both these diseases, and especially the former, remain unaffected by its use.

Chronic rheumatism, chronic rheumatic arthritis, chronic gout, are sometimes beneficially affected by iodide of potassium. This is especially the case with chronic rheumatic pains. It should, however, always be borne in mind, that secondary syphilis frequently produces pains which in all respects are like those of the so-called chronic rheumatism, and are thus frequently con-

founded with and included among those many diseases which are termed chronic rheumatism. It is very possible that some of the cases of rheumatism relieved by iodide of potassium are really cases of syphilis.

The pains which iodide of potassium removes are almost always worse at night, and such a character of the disease may be accepted as a strong indication for the medicine. (Such, indeed, is true also of actæa racemosa, but the one generally succeeds where the other appears to fail.) This assertion holds true whether it be rheumatism or some other complaint to which the pain is due.

The pain of syphilis, as is well known, is most generally worse at night, and in many cases of chronic rheumatism this is the case also. It is in such cases of rheumatism that iodide of potassium does good.

It is not uncommon to meet with persons—especially men—who suffer with a pain in the head, generally throbbing in character, and which may be felt over the whole head, or, beginning at the back of the neck, passes over the vertex to the brow. There may be intolerance of light. This pain is worse, or, indeed, only felt at night, and is then so severe as to be almost unendurable; and, as the patients express it, is fit to drive them out of their mind. The scalp, after the pain, which may be increased by alcohol, has passed away, is left very tender.

Whether such a disease is due to syphilis it is impossible to say, as it does not present the characteristic features of syphilitic disease. Such complaints may very generally be at once removed by iodide of potassium in ten-grain doses, repeated three times a day.

Barrenness has been, in some cases, overcome by iodide of potassium. It is to be presumed that, in such cases, the cause of the sterility was syphilis.

It has also proved of signal service in some cases of chronic Bright's disease, even when the dropsy has been extensive, and the urine very scanty. Under its influence the urine, in these successful cases has considerably increased, and with this increase the dropsy has disappeared, while, at the same time, the general health has

considerably improved. Possibly these patients have owed their Bright's disease to syphilis.

It has been recommended in tubercular disease and in cancer, but experience has failed to corroborate the recommendation. Iodide of potassium is useful in both acute and chronic colds in the head.

Iodine has been detected in the blood, in the saliva, in the urine, and in the milk. It has been detected in the urine of the sucking child, whose mother was taking iodide of potassium. It is probable, from its great diffusive power, that it might be detected in all the fluids bathing the tissues or moistening the cavities.

It appears in a few minutes in the urine, and even still earlier in the saliva. The rapidity of its absorption is, of course, in common with that of other medicines, influenced by the state of the stomach and vascular system, the absorption occurring more slowly when these are replete. The statements concerning its influence on the various constituents of the urine are so discrepant, and the observation made on the subject so very imperfect, that at present our knowledge on this subject must be considered to be nil. When the administration of the medicine is discontinued it is rapidly separated from the body, and even after large doses soon none can be detected in the urine; nay, all trace of it may be lost in less than twenty-four hours after the withholding of the drug. It is stated that it may be detected in the saliva for some days after it has ceased to appear in the urine. This sounds doubtful.

Dose and Administration.—Five grains three times a day will generally be sufficient in most diseases. Sometimes, as rheumatoid arthritis, and in cases of syphilis, no good is obtained until much larger quantities—as ten to fifteen, or even twenty, grains —are given at a dose.

Rapid sloughing of some syphilitic sores may be arrested, and healing promoted, by large doses of this medicine. Full doses not uncommonly succeed when smaller ones have failed.

For the removal of syphilitic nodes from the membranes of the brain, five to ten grains, repeated three times a day, is generally

sufficient. In this disease, the pain is not uncommonly at first made worse by the remedy, after which the complaint rapidly declines. There is no affection in which this medicine works such striking results as in that last named. The iodide of potassium may be conveniently administered in milk.

BROMIDE OF POTASSIUM.
„ SODIUM.
„ AMMONIUM.

MANCHESTER ROYAL INFIRMARY

In physical and chemical properties, these salts are closely allied to the corresponding iodides; and yet in their action on the body they exhibit considerable differences.

As a local application, to ease pain, or remove spasm, bromide of potassium, in five parts of glycerine, has been applied, it is said successfully, to hæmorrhoids, fissures of the rectum, and to painful growths.

When bromide of potassium, in moderate doses, is taken for some time, or quickly, where large quantities are administered, there occurs loss of sensibility in the soft palate, uvula, and upper part of the pharynx. This is shown by the absence of any movement in these parts when they are touched, as such irritation does not excite the movements of deglutition.

On account of this property, these medicines are recommended to be used to remove or lessen the excitability of the throat when an examination of the larynx with the laryngoscope is made. It is even stated by some writers that washing the pharynx and soft palate by means of a brush with a solution of the bromide is sufficient to quiet these parts, and to enable a laryngoscopic examination to be made with ease.

As the bromides possess the power to remove sensibility from the pharynx, it has been thought to be very possible they may have a similar influence on the larynx, and may be able to lessen its excitability, and so be of use in those diseases accompanied by spasmodic contraction of the glottis, as whooping-cough and laryngismus stridulus.

Of course, such speculations are of little use till put to the test of experience. After close watching of the action of bromide of potassium on both these diseases, the author is convinced it can control and remove them.

The discrepant statements of the influence of this remedy on these diseases can be reconciled in the following way.

To speak first of whooping-cough. All observers must admit that some cases of this disease are altogether uninfluenced by this remedy; that in such cases it neither lessens the frequency nor the severity of the paroxysms of coughing. In other cases, it appears, however, to act in both ways.

The bromide, the author believes, will be found to be useful only in simple, uncomplicated whooping-cough. If there be fever, or much catarrh of the lungs; if there be present pneumonia, or tuberculosis; or if the child be teething, and the gums are swollen, red, and painful; or if there be any gastric irritation, then this remedy fails to do any good till these disorders have been met and controlled by appropriate treatment. When this has been done, or in simple, uncomplicated cases, the bromide of potassium does certainly possess great power over the disease, lessening both the frequency and severity of the paroxysms.

It is thus found to be of most service in the summer, and when the weather is genial and mild.

In general, alum or lobelia inflata are to be preferred, as they act more promptly and surely; but the alum is only useful under the same circumstances, which control the usefulness of the bromides. It can only be given in uncomplicated cases.

Next as regards the action of bromide of potassium on laryngismus stridulus. Here also the remedy can control the disease, but only under conditions very similar to those which limit its usefulness in whooping-cough. If any irritation, such as from teething, is present, this must be removed before the remedy appears to possess any power over the complaint.

As, however, we possess in cold sponging such an efficient and prompt cure for laryngismus stridulus when any irritation has been removed, we shall not need to resort to the bromide, but

can, by cold sponging, at once cut short the complaint. (See Cold Bath.)

The salts of which we are treating are sometimes useful in both these complaints when complicated by convulsions. It not unfrequently happens with both laryngismus stridulus and whooping-cough during a paroxysm for the obstruction in the larynx to become so great as to cause very imperfect oxidation of the blood, and so partial asphyxia, which condition may produce an attack of convulsions.

When such convulsions occur, their repetition can be prevented by the bromides, even when it apparently leaves the disease otherwise uninfluenced.

Here again, with laryngismus stridulus, cold sponging is mostly sufficient to avert the convulsions by preventing the spasm of the glottis on which they depend. But in those cases where, from the effects of any irritation, the cold sponging remains without any effect, the convulsions can, in most instances, be stopped by the bromide of potassium, and so one of the gravest, nay, almost the only danger of this disease, can, by its use, be removed.

In the following complaint of the throat, the bromide will be found of use. It occasionally happens that children, from the time of their birth, and without any malformation of the throat, and who can swallow solids with ease, are choked every time they try to drink fluids. This is an affection which may in no way be connected with diphtheria, or other affections of the throat. Such children may be much benefited by the bromide of potassium.

On the stomach the bromides, as far as is at present known, appear to have very little influence.

On the intestines in certain diseases, these salts have a beneficial influence; as, for instance, in a form of colic, which sometimes affect children a few months to one or two years old. With such the walls of the belly are retracted and hard, while the intestines can be seen at one spot contracted into a hard lump the size of a small orange, and this contraction can be seen through the walls of the belly to travel from one part of the intestines to another.

These attacks of colic are very often repeated, and produce excruciating pain. The form of this disease of which we are now speaking, is unconnected with either constipation, or diarrhœa, or flatulence. It is sometimes associated with a chronic aphthous condition of the mouth. It generally resists all kinds of treatment, but will mostly at once yield to the bromides.

Like the iodides, these salts pass quickly into the blood, and, respecting their influence on the organs to which they are conveyed by this fluid, we shall next speak.

The bromide of potassium is used for a very great variety of diseases, but in none are its virtues more conspicuous than in the treatment of convulsions.

It is of use in all forms of convulsions—it is good in epilepsy, in the convulsions of Bright's disease, and in the convulsions of children, whether these be due to centric or eccentric causes. Although convulsions may be excited by many causes, it is probable the conditions of the nervous centres which immediately produce the attack, are in every instance the same; and it appears to be these conditions which the bromide is able to control, and hence it checks the convulsions of epilepsy, of Bright's disease, from teething, or from worms.

It is, however, necessary to speak separately of the influence of bromide of potassium on the convulsions of these different diseases.

In no complaint is the bromide of potassium used with greater advantage than in epilepsy. But it is not equally useful in all forms of this disease, as attacks of petit mal are mostly uninfluenced by the drug. It is the convulsive form of epilepsy which is so remarkably amenable to the bromide.

All authorities are agreed on the great power bromide of potassium has over this form of epilepsy.

In by far the greater number of cases, the fits under its influence become much less severe and less frequent. Even when of great frequency and severity, when repeated perhaps several times a day, their recurrence may be postponed for weeks, and even months; nay, in some cases, the return of the fit has been delayed for years.

As might be expected, the effects of the drug are most pronounced, when the disease is of short standing.

Cases of the convulsive form, however, occasionally occur, over which this salt appears to exert no influence, and in which the fits recur as often and are as severe as when no medicine was taken. Neither is it possible at present to foretell in which instance the medicine will succeed, and in which it will fail.

In the treatment of epilepsy, the remedy should be given in doses of 10 to 20 grains, and be repeated three times a day. If the attack occurs only at night, then a full dose of 30 grains should be taken at bed-time, and this will be found the best way to avert the fit.

It may be conveniently taken in beer.

The bromide may be continued for months or years, if the patient is only benefited and not cured by it. But its administration should be at times omitted for a few weeks, or the system becomes accustomed to its presence; it then loses its power over the disease, so that it not uncommonly happens, for the good effects which were marked at first, to altogether cease, and for the fits to recur with their old severity and frequency. If the drug be now withheld for a time, on resuming it all its former influence over the attacks will be restored to it, and the patient is a second time benefited by its use.

Concerning the influence of the bromide of potassium on the convulsions which sometimes accompany whooping-cough and laryngismus stridulus, we have already spoken. In all other diseases which are accompanied by general convulsions, the bromide should be resorted to, and will often succeed. Of course, when possible, the exciting cause of the convulsive attacks should be removed; but where this proves impossible, or if it cannot be discovered, this salt will often be found sufficient to control and prevent the epileptiform attacks.

The convulsions caused by worms in the intestines sometimes resist completely the influence of this remedy.

The convulsions which accompany simple meningitis, or which continue after the inflammation has declined, but has left serious damage behind, may often be checked by the bromide of potas-

sium. This salt has of late been much recommended by Dr. Begbie as a soporific, and has been found of especial use in removing the sleeplessness which not unfrequently occurs during the convalescence from acute diseases. It is often of service for the same purpose even during the febrile stage of inflammatory and specific fevers, such as pneumonia, rheumatism, or typhoid fever.

In sleeplessness from other causes, as overwork, grief, dyspepsia, &c., it may be employed with the expectation of success. In delirium tremens, the bromide of potassium is often of conspicuous benefit, by removing the delusion, and calming the delirium, and by procuring sleep. Its usefulness is most apparent in the earlier stages of this disease, before the delirium has become furious, and is also of very great service in removing any delusions that may remain after the attack has been partially subdued.

When used to produce sleep, fifteen to thirty grains should be given at night time; and if this should prove insufficient, the same dose may also be taken in the morning. When employed in delirium tremens, twenty to thirty grains, or even more, of the drug may be given every two hours till the patient is made to sleep.

As a soporific, the salt often succeeds when opium has failed.

Dr. Begbie, who has drawn attention to the influence of the bromide of potassium on the complaints of which we are now speaking, recommends it to be given to persons who have overtaxed their brain by study, or a too close application to business. In such, it calms the excitement, procures sleep, and removes from them the giddiness, noises in the ears, and perversions of the external senses which may be present. It is most invaluable in such cases. He also recommends the salt in acute mania.

It sometimes happens that women, in the latter months of pregnancy, become the subject of the most frightful imaginings at night. They are under the impression that they have committed, or are about to commit some great crime or cruelty, such as murdering their children or husbands. These delusions may

be removed, and in their place calm, refreshing sleep be substituted by the influence of bromide of potassium.

Bromide of potassium is of great service in preventing that form of night screaming of children, which appears to be allied to nightmare. Children with this complaint may be but a few months, or several years old. Sometimes the attack occurs only once or twice a week, as is usually the case with the older children, or it may be several times repeated each night. The screaming may continue a few seconds, or several hours. These children, while screaming, are generally quite unconscious of what is occurring around them, and cannot recognize, nor be comforted by, their friends. They are generally horribly frightened. At other times, a somewhat similar condition is met with in children a few years old, a state very similar to somnambulism, but sometimes apparently allied to epilepsy. The child gets out of bed while fast asleep, walks about the house, and performs, quite unconsciously, various acts, such as it does when awake. This state is not accompanied with any terror. With the screaming and fright which has just been mentioned there sometimes occurs squinting, which, after some time, becomes permanent. The screaming may be prevented, and the squinting removed in such cases, by the bromide of potassium. This affection in children is very generally connected with deranged digestion; and when such is the case, the condition of the stomach or intestines should be attended to; but if no such derangement be present, or in spite of such, the bromide will give quiet and refreshing sleep.

The nightmare of adults will generally yield to the same medicine.

Men, but especially women, and more usually those who inhabit towns, become the subjects of great despondency and low spirits. At times this is so bad as to make them, as they express it, "feel as if they should go out of their mind." These distressing symptoms can very generally be removed by the use of the bromide of potassium.

Dr. Begbie has used the same salt with very great advantage in some cases of asthma, and also of diabetes. It sometimes relieves the pain of neuralgia.

It is also used with most decided benefit for its influence on the organs of generation.

Its power to check some forms of menorrhagia is equal, if not superior, to that of any remedy we possess. Over that form of flooding, which is due to tumours of different kinds of the uterus, it has less control than ergot and some other remedies.

Its administration, to check profuse menstruation, must be regulated by the circumstances of the case. If the loss of blood occurs only at the natural menstrual period, it will be sufficient to begin the medicine about a week before the loss of blood is expected; and when this has for the time ceased, it should be discontinued till the next attack is about to begin.

If, on the other hand, the loss of blood occurs every fortnight or oftener, the medicine must be given without any intermission till the disease is well controlled; and when the discharge has been brought to its right period and amount, it is still desirable to give, for a short time, before each monthly period, a few doses of this medicine.

This remedy has been recommended by Dr. Begbie in nymphomania and puerperal mania. It is also employed to stay the discharge from persons who suffer from frequent seminal emissions, and whose health has in consequence suffered.

The author has no doubt, from his own experience, but that the drug does possess this power. Its employment should be supplemented by cold sponging of the scrotum and perinæum, and the suspension of the testicles in cold water for some minutes, night and morning.

It proves useful in allaying various forms of hyperæsthesia, and sometimes eases the severe pain of chronic arthritis.

If the medicine is continued for a long time, as sometimes happens in the treatment of epilepsy, the physiological effects of the drug become apparent. "Diminished sensibility, followed by complete anæsthesia of the soft palate, uvula, and upper part of the pharynx is the first symptom that the patient is getting under the influence of the drug. The sexual organs are amongst the first to be influenced, for there is soon produced failure of sexual

vigour, and after a time marked diminution of the sexual appetite itself. Another frequent, if not constant, result of the prolonged administration of the bromide, is an eruption of small boils in successive crops, chiefly over the face and trunk, and accompanied with troublesome itching" (Bazire). It also produces bodily and mental depression, and the patients become low-spirited, subjected to gloomy ideas, are soon fatigued, and unfitted for work. On the suspension of the medicine all these symptoms and appearances soon subside.

SULPHURIC, HYDROCHLORIC, NITRIC, PHOSPHORUS, AND ACETIC ACIDS.

The members of this group are powerful acids, and as such have a very strong affinity for alkalies and bases. Some of them, as sulphuric and phosphoric acids, absorb water with avidity. They all possess a high diffusion power, and so pass with readiness through animal membranes and textures. These are the properties which explain most of their actions on the living body.

Skin.—When concentrated they produce most serious changes in the skin. These they effect by their affinity for the bases and water of the tissues, as well as in a minor degree for the organic substances themselves. From their great diffusion power they readily penetrate deeply beneath the surface, and continue their destructive action till they are diluted with water or neutralized by the bases or the animal structures they meet. Sulphuric and phosphoric acids, from their greater affinity for water, are especially energetic; they withdraw this element from the textures, and thus effect their complete destruction.

They may, if applied in quantity, destroy the tissues to a considerable depth, and produce a brown or black eschar.

The remaining members of this group, owing to their much less affinity for water, destroy the tissues less extensively, and their action is much more superficial, as they are soon neutralized by the substances with which they mix.

Sulphuric and phosphoric acids are never used undiluted, on account of their physical action on the tissues. Nitric acid, on the other hand, is frequently employed to destroy and remove the surface of foul and unhealthy sloughs and ulcers, and in virtue of a property of which we shall shortly speak, to change an unhealthy and unhealing action for one more healthy and prone to heal. It thus finds frequent employment in cases of soft chancres, indolent and broken bubo, cancrum labialis, &c.

From their action, which has just been explained, they excite in the tissues to which they are brought in contact a variable amount of inflammation. This is usually not very severe.

Nitric, hydrochloric, and especially acetic acid, may produce some vesication. The first of these colours the skin characteristically yellow.

They are often used for the purpose of exciting some inflammation, and very often with the best results.

It is now established that two diseased actions cannot exist actively in the same part; that one must yield to the other. On this principle, one or other of the three acids we are now speaking of, namely, nitric, hydrochloric, and acetic, are used. It is on this principle we apply with success an acid, most usually acetic, to a patch of herpes circinatus, and at once cut short a disease which tends to spread and to continue for a considerable time, and in its place establish an inflammation which quickly subsides and disappears.

It is thus that nitric acid induces a healthier action in indolent ulcers, or arrests the spreading of sloughing ones. Acetic and somewhat diluted nitric acids are frequently applied to warts, whose destruction they affect by withdrawing the bases they contain, and by dissolving the tissues of the warts themselves. But although either of these acids will fulfil the purpose for which they are applied, and in some cases completely remove the warty growth, more frequently a fresh and abundant crop springs up in the neighbourhood of those being treated.

Syphilitic warts and condylomata may be, with great certainty and without pain, removed by a wash of diluted nitric acid, with which they are to be kept constantly moist; a drachm

or two drachms of the dilute acid to a pint of water is sufficient.

The members of this group are more generally employed as external applications after they have been mixed with water. When thus diluted, they still excite some irritation, and for this purpose may be used with very great benefit as lotions in urticaria, as they are able to set aside the very troublesome itching of this complaint, and even to prevent the formation of wheals, and, in some cases, appear to be mainly instrumental in the removal of the disease.

As baths, acids, and especially nitric and hydrochloric acids, were more frequently employed than at present, and yet beyond all doubt, they exert a most powerful influence on the skin. A general bath, with 2 to 8 ounces of the strong nitric or hydrochloric acid, is a most powerful exciter of a torpid skin.

What influence, if any, these baths bring to bear on the other organs of the body, is at present quite unknown, as hitherto no experiments have been made for the settlement of this question. It is highly probable, however, that these acids, in common with other materials dissolved in baths, remain unabsorbed by the skin, and any change in the deep parts of the body which may ensue on their use, must be ascribed to their direct action on the skin. Profuse sweating can in some cases be effectually controlled by sponging the surface of the body with water weakly acidulated by acids. The sweat is an acid secretion.

To the skin, stripped of its cuticle, they act as stimulants, and thus nitric acid is frequently used as a lotion in the treatment of indolent and painful ulcers. It is in such cases a very valuable application.

When applied to the softer tissues, such as the dermis, mucous membranes, &c., they act as astringents and cause a direct condensation of the tissues, probably by removing a part of the base, by combination with which the albuminous substances were held in the soluble form.

From their astringency they check profuse secretions from unhealthy sores. Nitric acid is of most frequent application in such cases. Nitric and acetic acids are often used as tests for

albumen when it is in solution. This they precipitate, as we have stated, by abstracting from it the base with which it was previously combined, and, in setting it free, convert it into an insoluble substance.

These acids when diluted, very effectually check bleeding from the smaller vessels and capillaries. This they effect by constringing the tissues, exciting the muscular coat of the arteries to contract, and by coagulating the blood in the ends of the wounded vessels, and so effect their plugging. Thus vinegar, as it is always at hand, is valuable when diluted, in checking bleeding from leech bites, piles, cuts, &c.

Before we speak in detail of the action of acids on the various parts of the alimentary canal, it will save much repetition, and make what we have to say much clearer, if we make at first a few general remarks on the action of acids on the secretion of the different glands which open into the alimentary canal.

It has been fully established by repeated and careful experiments, that dilute acids, when taken into the stomach, possess the power to check its secretion; while, on the other hand, alkalies stand prominent among the most powerful exciters of the secretion of the gastric juice. From these facts the more general law has been inferred, namely, that acids possess the power to check the production of acid secretions from glands, while they increase the flow of alkaline ones, while the very reverse is the case with alkalies, which are supposed to check alkaline, but to increase acid secretions. This general law is made the more probable, as it fully explains the effects, which experience has shown to be true, of acids on the secretions of the alimentary canal in disease.

Mouth.—These acids produce the same effect on the mucous membrane of the mouth as on the skin, and, for the most part, are used for the same purposes.

Thus strong nitric acid is often applied to foul and sloughing ulcers to change their nature and to check their progress.

They are in part neutralized by the alkaline secretion from the salivary glands; while that which remains free precipitates the mucus which coats the mucous membrane, and, if in suffi-

cient quantity, attacks the mucous membrane itself. To this, if not too strong, they act as astringents, and may thus be used, when the lining membrane of the mouth is relaxed or ulcerated as in ulcerative stomatitis, salivation, &c., but other astringents are more suitable and to be preferred, for the acids are apt to dissolve the earthy constituents of the teeth, and to cause them to decay. These remedies should thus be taken through a quill, or a glass tube, or a reed.

But nitric acid has a farther action on the mucous membrane of the mouth, and may be given in small medicinal doses with conspicuous benefit when this membrane is inflamed or diseased in different ways, as in ulcerative stomatitis, aphthæ, salivation from mercury, or when the membrane is red, inflamed, and glazed, a condition not unfrequently met with when there is much irritation of the digestive organs.

These, with other acids, such as citric, tartaric, &c., still the thirst of fever patients much more effectually than plain water. This is still more the case if the acid is made rather bitter with some agreeable-tasting substance, as orange peel or cascarilla. In fevers, much of the troublesome thirst is not the expression of the wants of the general system, but is owing to the dryness of the mouth and throat. This disagreeable local sensation is very liable to lead fever patients to drink more water than is really good for them, and to produce loss of appetite, indigestion, and even diarrhœa and flatulence.

The action of acids in lessening this thirst has already been explained. Acids, as we have seen, probably increase alkaline secretions, and thus the acid drinks used by fever patients promote, in the salivary glands, an increased secretion. Bitters, as we shall subsequently see, possess the same power, and hence it is that acid and bitter drinks, by their action on the salivary glands, keep the mouth and throat comfortably moist, and so remove the distressing feeling of thirst.

By lessening the troublesome thirst they quiet the patient, and remove much irritability of temper, and so favour sleep. By this soothing influence the pulse grows quieter, and the heat of the body diminishes; and so it is that these medicines, espe-

cially the organic acids, are largely employed as fever medicines. To the throat they are applied for the same purpose as to the mouth. Thus, nitric acid is beneficially employed, undiluted, as a topical application to the foul sloughs or ulcers which sometimes occur with scarlet fever, or other diseases.

Bretonneau has strongly recommended the application of strong hydrochloric acid to the throat in diphtheria. The acid may be used undiluted, or it may be mixed with an equal part of honey, which gives the mixture consistence, and makes it hang for some time about the parts on which it is painted. It should only be applied to those spots of the mucous membrane attacked by the diphtheritic inflammation, and not to the neighbouring healthy tissues, as it will produce in these latter active inflammation; and it is well known the diphtheritic membrane is very liable to be formed on inflamed surfaces, and so the application may favour the spread of the disease. This treatment, however, is of little, if any, service, and, in the author's experience, always fails to check the progress of the inflammation.

Nitric acid, in small medicinal doses, may be given with benefit when the throat presents the same appearances as those of the mouth, in which it is found to be so useful.

Stomach.—It is mainly by the agency of acids that the albuminous constituents of food are digested and rendered soluble. But all acids are not equally efficient for this purpose. Lactic and hydrochloric acids far outstrip all others in this respect, while sulphuric acid hinders rather than promotes digestion, by precipitating the albumens in an insoluble form.

The action of acids on nitrogenous substances is greatly heightened by the addition of pepsin.

Dilute hydrochloric acid may thus be employed to assist digestion where the secretion of gastric juice is scanty. It will be apparent, after what has been stated at the beginning of this section concerning the action of acids on acid secretions, that the time of its administration, in respect to the meals, is all important. If given before the meal is begun, acids check the secretion of the acid gastric juice, and so hinder, instead of aid, digestion. To be useful where there is scanty secretion, the acid

must be given after the meal is finished, and the secretion from the membrane of the stomach is completed, when the additional acid will assist the action of that secreted naturally, but in too small a quantity. In many cases of atonic dyspepsia alkalies are to be much preferred to acids, but they must, of course, be given a short time before the meal is begun, as they then stimulate abundantly the secretion of the gastric juice. In most cases of atonic dyspepsia, as we have said, alkalies, with the precautions noted, are superior to acids given after the meal is finished, although, as is well known, there occur certain cases in which the use of acids answers the wishes of the medical man more completely than the use of alkalies. Such cases are presumably those where the mucous membrane has been very considerably damaged, and is much degenerated by excesses in eating or drinking, and where, owing to the degeneration of the glands of the stomach, no stimulant can excite a sufficient flow of the gastric juice.

Acids, as we have seen, possess the power to check or lessen the secretion of the gastric juice. In health such a result is never desired; but in many diseases of the stomach, or from sympathy with other distant organs, an excess of acid is poured into the stomach from its follicles. By the administration of acids shortly before food is taken, this undue secretion is checked, and the patient cured. But acidity of the stomach is often owing to excessive or irregular fermentation, which leads to the production of a large quantity of different acids, as acetic, butyric, and lactic.

This excessive or irregular formation is checked by acids; and as excessive secretion of the gastric juice, or excessive formation of acids by fermentation, are the two causes of acidity of the stomach, we possess in acids, remedies which have the power to control and check the acidity of the stomach, and with it the very distressing symptoms which accompany this condition, whether it be due to pregnancy, disease of the uterus, calculus of the kidneys, or the various dyspepsias or more serious diseases of the stomach.

This conclusion, which it may be thought is founded on

theoretical considerations, is abundantly proved in practice, as it has been long known to practical men that the administration of acids immediately checks acidity, no matter with what disease it is connected, and at once removes the acid eructations, the heartburn, and the sense of discomfort in the chest and epigastrium, which arise from the excess of acid in the stomach. Hydrochloric or nitric acid are generally preferred, and a small medicinal dose of these, separately or combined, is always sufficient to effect all that is desired, provided the conditions of their administration, which have been insisted on, be complied with, namely, that they be administered a short time before each meal.

Patients are sometimes greatly troubled and annoyed by eructations of an offensive gas, with the odour and flavour of rotten eggs; it evidently consists largely of sulphuretted hydrogen gas.

Dr. Day, of St. Andrew's, has noticed that in such persons much oxalic acid is present in the urine, and he strongly recommends, for the removal of this disagreeable complaint, the employment of the mineral acids.

Nitric acid is also found of great use in the treatment of those persons who suffer from dyspepsia, with oxalic acid in their urine, and from great mental depression, even where there are no eructations of sulphuretted hydrogen gas.

A clue to the administration of acids, on the one hand, or of alkalies on the other, in the treatment of the dyspepsias, can sometimes be obtained by testing the reaction of the fluids ejected from the stomach. Not unfrequently soon after a meal, a fluid regurgitates, often without any labour on the part of the patient, into the mouth. Sometimes this is strongly acid, a reaction which is easily discovered by the sufferer. If such be the case, the acidity and pyrosis can be almost immediately removed by the exhibition of nitric or hydrochloric acid shortly before each meal.

On other occasions the fluid of pyrosis is of an alkaline reaction. It is often accompanied by much distress, with nausea and vomiting of the food which has shortly before been eaten, and when such occurs the rejected contents of the stomach often

possess a strong alkaline reaction. Here all the distressing symptoms, the nausea and the vomiting, may be removed by the use of an acid immediately after the meal is concluded. On theoretical grounds, we should expect an alkali administered shortly before the food is taken, to yield even more satisfactory results. The author has had no experience of the use of alkalies in such cases.

It need hardly be said that acids given soon after a meal to patients troubled with acidity and heartburn greatly aggravate their sufferings. It is adding fuel to the fire. From what has preceded, it must be sufficiently apparent that these remedies should not be continued too long, or they may not merely perform the office for which they were administered, namely, check undue acidity of the stomach, but may do more than this, and lessen the secretion of gastric juice to a much greater extent than is required and desired, and so actually induce the very opposite condition to that for which they were, in the first instance, employed. This will explain what must be well-known to those who have watched the action of acids on the stomach, that if too long continued, the improvement in the general health, which first follows their use, lessens and then ceases, and fresh symptoms arise, which, with apparent strangeness, are relieved by the very opposite treatment to that which had previously been adopted with benefit.

If their administration be long continued they excite a catarrhal inflammation of the mucous coat of the stomach and intestines. The latter is often accompanied by diarrhœa, and even general wasting. This action of acids explains the occasional effects of vinegar, when taken for a long time, in reducing the stoutness of fat people. For this purpose vinegar is sometimes taken surreptitiously in wine-glassfuls several times a day. It may reduce the stoutness, but it does so at the expense of most serious damage to the body, which may lay the foundation of some fatal disease. This practice cannot be too strongly condemned.

Acids, it has been ascertained, possess no power to check the growth of sarcinæ in the stomach. It is a common practice

among soldiers, when intoxicated, to drink a wine-glassful of vinegar in a tumbler of water, with the view to remove the intoxication. Whether it does possess the power to sober drunken people is not quite certain, but that it for the time steadies them, and gives more precision to their movements, is, no doubt, correct; and by this treatment drunken soldiers are able very speedily to become steadier in their gait, and to pass muster when they present themselves at barracks.

In bleeding from the stomach, by their action as astringents, and their power to coagulate the blood, they are useful. Sulphuric acid is generally preferred before the other members of this group. Many other astringents are surer in their action to check bleeding from the stomach.

From their high diffusion power much of these acids passes from the stomach into the blood. As those which pass into the intestines must, to a great extent, be neutralized by the alkalies of the bile and pancreatic juice, they can influence as acids by direct contact, to a very small extent, the middle and lower part of the intestinal tract. But, at the same time that they become neutralized, they set free some of the biliary and weaker acids, and so must heighten, in some degree, the acidity of the contents of the intestines.

Dilute acids are used as antidotes in poisoning by the alkalies.

What influence the acids exert on the pancreas or liver is unknown. It has been suggested that, as the secretions from these two glands are alkaline, the acids may have the power to increase their secretion, but nothing is known with certainty on this point. It has been long held that nitric acid acts in some way beneficially on the liver when chronically diseased, as in chronic congestion and cirrhosis, and that by its administration we can increase the flow of bile after the liver has struck work from the excessive use of mercury.

From what has preceded, it will be seen that acids can check acidity of the intestinal canal, and this will, perhaps, explain in part their power to control different kinds of diarrhœa. Sulphuric acid is highly useful in checking summer and choleraic

diarrhœa. Of this there can be no doubt, although, as it is generally administered with opium and some warm carminatives, it is difficult to distribute to each remedy its exact share of praise. The mode of its action is less certain than its efficacy; it may, in part, act by controlling the formation of acid in the intestines, or it may, as has been supposed, act as an astringent, and so check the diarrhœa, but if the latter be the true explanation, the influence on the lower and middle part of the small intestine must be exerted through the nervous system, and by means of nervous sympathy, which exists between one part of this canal and another, as the acid is soon neutralized and converted into a sulphate in the upper part of the small intestines, and with this conversion at once losses its astringency. Sulphuric acid is often thought to be capricious in its action, and much uncertainty is supposed to attend its administration. This uncertainty in its results can be accounted for, in many instances, by the dose in which it is given. Its good effects most certainly follow, on a small medicinal dose; if given in a full one it increases the acidity of the canal, and may aggravate, and not ameliorate, the diarrhœa. By Dr. Neligan and other authorities it is recommended in chronic diarrhœa, and to control the "profuse sweating and colliquative diarrhœa of hectic."

Nitric acid, in small medicinal doses, is also of great use in many diarrhœas. Thus it often acts most admirably in the diarrhœa of children, when the motions are green, curded, mixed with mucus, and their passage accompanied by much straining. Such motions have often a very sour smell, which may always be speedily checked by the exhibition of acids, and when this is controlled, the diarrhœa, which is often dependent on the acidity of the intestinal canal, also ceases. Other remedies are, on the whole, to be preferred to acids in the treatment of this kind of diarrhœa. Nitric acid may sometimes be used with great benefit, especially when given with pepsin in that chronic diarrhœa of children when the motions smell sour and most disagreeable, and are pale and pasty.

Piles are successfully treated by the application of strong nitric acid to the enlarged and dilated vessel; two, or at most

three, applications are sufficient; nor need the acid be applied to the whole tumour, but its application to one or two points is sufficient. A superficial slough follows. It is not universally applicable, and is only so to internal piles, in which it produces little or no pain. It is useful in granular or ulcerated piles. After the slough separates, the sore contracts, and by its contraction diminishes the swelling. This method is inferior in most cases to the ligature.

A lotion of a drachm or half a drachm of the dilute nitric acid to half a pint of water is an excellent application to bleeding piles. It stays the hæmorrhage, constringes the swollen and inflamed tumour, and much eases the heavy, tensive, disagreeable pain.

Acids are reputed to heighten the action of purgative medicines, and sulphuric acid is sometimes employed for this purpose. Its employment is most usual when small doses of purgative salts, as Epsom salts, are used, and when at the same time a tonic and bracing action on the mucous membrane is desired, as in many cases of anæmia of young women.

In the Blood.—On their passage into the blood, if not already neutralized, these acids must at once become so, and henceforth it would appear probable, that their history must be that of the salts they form. And yet the reputed action of these acids on the organs of the body is so different from that of any of their salts, that their behaviour must be spoken of separately from the salts they form.

On combining with the alkalies of the blood, they must set free some weaker acids, and so lessen to a slight extent the alkalinity of that fluid. That this is so, is shown by the increased acid reaction of the urine, which follows on the use of these mineral acids.

What further effects they may have on the blood is at present quite unknown. They are reputed to be tonic and bracing, but the improvement in the general health which they produce, may be more safely attributed to their action in the intestinal canal. Still, they produce some changes in the fluids and solids of the body, as they, and especially vinegar, may be used as preven-

tives of scurvy, with benefit, when lime-juice, or fresh vegetables are not to be obtained.

By many, nitric acid is recommended as very useful in secondary syphilis, and it is even stated that salivation has been caused by its administration. If such be ever the case, the salivation may be due to the direct action of the acid on the mucous membrane of the mouth, increasing the alkaline secretion of the salivary glands.

After the use of acids in fevers, we sometimes observe an abatement in the rapidity of the pulse. The explanation of this result is probably not to be found in the direct action of the acid on the heart or nervous centres, but is, with more probability, ascribed to the diminished restlessness from the allaying of the troublesome thirst of such persons by acid drinks.

Sulphuric acid, especially in conjunction with sulphate of zinc, is considered by some to be able to check the profuse sweating of phthisis and other exhausting diseases; and by Dr. Graves, a similar action was ascribed to vinegar. The following was his favourite recipe:—Distilled vinegar, ℥ij. Laurel-water, ʒij. Syrup, ʒvj. Aqua, ℥v. Of this he gave an ounce or two ounces every third or fourth hour. And, further, sulphuric acid appears to possess a very decided power to check bleeding from the lungs or womb. It is difficult, indeed, to understand how an ordinary dose of sulphuric acid, after it has become so greatly diluted by its admixture with the blood, can exercise such an influence; and our difficulties are still further increased, when it is borne in mind that these acids are, either before or immediately after their entrance into the blood, converted into salts, as sulphates, nitrates, and phosphates. Whatever influence, therefore, is exerted on the distant organs must be effected by them in these combinations, and yet we do not ascribe to any of the salts of these acids similar properties to those ascribed to the acids themselves.

In such like questions, experience is found to be a safer guide than speculation and theory. For the subtlety of even small doses, and their power to influence distant organs of the body and to alter their secretions, is well shown by the influence of these medicines on the mother's milk, which, if she has taken

acids for some time, causes in the child sickness, diarrhœa, and colicy pains.

Phosphoric acid has been recommended in diabetes. By Griesinger, who has carefully studied the action of this medicine on this disease, it is considered to do more harm than good. He pushed the dose until an ounce of the acid was taken daily. He found the sugar in the urine was increased after such doses. By their exhibition, the members of this group increase the acidity of the urine, and it has been proposed to dissolve phosphatic calculi by thus rendering the urine more acid. The objections to this method of treating calculi are very great, as the action of acids on the mucous membrane of the stomach and intestines prevent their long use; whilst to effect any change in the size of a stone, they must be taken for a very considerable time, as the acidity of the urine is but slightly heightened by their administration.

Nitric acid, sufficiently diluted, as an injection is a far more effectual treatment for phosphatic calculi, and has been employed with success by some eminent surgeons. Dr. Roberts, of Manchester, from his experiments on the solvent power of dilute solutions of this acid on calculi after their removal from the body, considers the treatment of much wider application than is at present made of it. Such injections, by neutralizing the urine if alkaline, and preventing its decomposition, preserve for the time the mucous membrane of the bladder from the irritation of the alkaline urine.

The further influence of sulphuric, nitric, and hydrochloric acids on the urine is unknown. Of the influence of acetic and phosphoric acids, we shall speak in another place.

Before we close our remarks on the action of acids on the body, it is right to say that phosphoric acid may possess many other properties than those specified above; but these will be mentioned when we speak of the phosphates, in which form this salt exists in the blood, and as such, works many of its good effects on the diseased body.

Dose.—Five drops of the dilute acid will be found amply sufficient for the purposes for which they are given.

SULPHUROUS ACID AND SULPHITES.

As both the acid and its salts are used very generally for the same purposes, they have, for convenience sake, been grouped together.

Dr. Dewar, of Kircaldy, has drawn attention to the useful action of sulphurous acid in various diseases to be immediately mentioned, and in this section there is given a short abstract of his remarkable paper.

To the skin the acid is of great use in chloasma, by destroying the parasite on which the disease depends. For this purpose the acid solution of the pharmacopœia, mixed with an equal quantity of glycerine, may be used (Garrod). Warm-baths should also be employed to remove the cuticle infested by the parasite.

Dr. Dewar applies the sulphurous acid in three ways; either as a solution, or by fumigation, or by the spray-producer. He asserts that chilblains and chapped hands may speedily be removed by solutions, or by fumigation. A solution may be made with equal parts of the acid of the pharmacopœia and of water, or glycerine. Such a solution, it is asserted, at once eases the burning, and prevents the spread of erysipelas. Wounds, surgical or accidental, and also sore nipples, may be treated by either the pure or diluted solution, constantly applied, and bruises may be prevented or quickly removed, by the same treatment.

Internal Use.—Internal diseases are equally well treated, according to the same authority, by sulphurous acid. Amongst others the following:—Cold in the head, influenza, tonsillitis, malignant sore throat—scarlatinal or not—laryngitis, chronic bronchitis, chronic phthisis, asthma, croup, clergyman's hoarseness, and typhoid fever.

To the throat the acid may be applied by fumigation, or by inhalation, a few drops being added to boiling water, the steam from which is inhaled. It may also be applied by a camel's hair brush, or by the spray-producer.

Into the lungs it may be conveyed by fumigation or inhalation, or by the spray.

The pharmacopœia acid is used, which, if properly and a little carefully employed, excites scarcely any irritation and annoyance to the patient.

The applications may be conducted in the following ways :—

"Put a few red cinders into a kitchen shovel, set this upon a wooden stool, and then sprinkle flour of sulphur from time to time, till the room is not inconveniently filled with fumes."

The spray may be applied by a vaporiser composed of vulcanite, constructed upon Dr. Dewar's plan. The instrument should, with children, be held about three feet from the mouth, and the fine spray produced should be inhaled. This may be repeated according to circumstances. If the disease be acute, and no time can be lost, it may be repeated every hour, or even oftener.

For the relief of rheumatism and gout, Dr. Dewar advises, besides the fumigation, the bed-clothes to be exposed to the strong fumes, and then spread over the patient. By such treatment sweating breaks out, and, after a refreshing sleep, the patient is much relieved of his pain.

In applying the spray to adults, Dr. Dewar advises "to hold the nozzle of the instrument about six inches from the patient's mouth, and administer three or four whiffs to begin with; then, after a corresponding interval, during which a cough or two is given, the process is repeated, about twenty squeezes in all, which represents the injection of from forty to sixty minims of acid. The acid should be pure." (Brit. Pharm.)

The strong solution, or this variously diluted, is an excellent wash for the mouth when its mucous membrane is infected by thrush. This it speedily removes, to the great comfort of the patient. Dr. Lawson speaks highly of sulphurous acid as a remedy for pyrosis; indeed, he says it never fails to be of service. The sulphite he has found useless in this disease.

Sulphites have been employed to destroy sarcinæ and torulae in the stomach, and it has been lately asserted the same salts, when administered by the mouth, have the power to prevent

decomposition and putrefaction of the urine in the bladder from cystitis. Dose of the solution of the acid, five to twenty minims; of sulphite of soda, five to twenty grains.

CHROMIC ACID.

Chromic acid is used as an escharotic, and is useful to remove warts from the genital organs. It has been successfully employed to remove large condylomata and warty growths from the nose and elsewhere.

A solution of this acid is said to allay itching, although the kind of itching is not mentioned. If its full strength be desired, sufficient water merely is added to the acid to form a thick paste. A weaker solution, composed of one or two drachms of acid to the ounce of water, is generally sufficiently powerful to remove small growths. As soon as the application is completed—by means of a camel's hair brush—the part must be well washed with water. The application often occasions great pain.

Group containing CAUSTIC POTASH, SOLUTION OF POTASH, CARBONATE AND BICARBONATE OF POTASH.

ACETATE OF POTASH, CITRATE OF POTASH. The corresponding Preparations of Soda—POTASH SOAP, SODA SOAP, BORAX.

The members of this group are all endowed with a very high diffusion power, the potash more so than the soda salts, and all are very freely soluble in water. With the exception of the acetates and citrates of potash or soda, they have an alkaline reaction, which is weak in some, as the biborate of soda, but is very great with others, such as caustic potash or soda.

Many of these substances have a strong affinity for water, and can abstract it from animal tissues, and completely destroy them. This is especially the case with the caustic salts, less so with the carbonates, and very slightly so with the bicarbonates and acetates.

They also dissolve the nitrogenous constituents of the animal textures, which property is in proportion to, while it is distinct from, their affinity for water.

It is desired at this place to draw prominent attention to one property of alkalies, namely, their power to increase the secretion of the gastric juice, that is to increase an acid secretion. We think it is probable that this fact may be extended into the general proposition, that alkalies applied to the orifices of glands, whose secretion is acid, increase their secretion; while, if applied in a corresponding way to glands, whose secretion is alkaline, this is lessened or checked.

As we proceed with the consideration of this group, we shall see there is reason to believe this general proposition to be true, and that it affords an explanation of many of the effects of alkalies on the body, and gives us a clue to their application in disease.

Action on the Skin.—By their affinity for water and by their solvent action on the nitrogenous tissues, several of these substances can destroy the skin or other structures to a considerable depth.

The caustic alkalies, as they possess a greater affinity for water and solvent action on the tissues than the remaining members of this group, are the most efficient in this way. The carbonates and solutions of the caustic alkalies come next, while the bicarbonates, acetates, and the rest of this group, have very little power in this respect.

The caustic alkalies, undiluted, or sometimes, to lessen their activity, mixed with caustic lime, are not unfrequently employed to destroy warty growths, or the hard edges of some unhealing sores, such as chancres, or to open abscesses, or to make issues.

When employed for these purposes, it must be borne in mind, that with the rest of this group, the caustic alkalies have a very

high diffusion power, which enables them with very great readiness to penetrate deeply and widely the tissues.

And so it often happens, if great care is not taken, that a much larger amount of destruction is accomplished than was desired, and that not merely the wart, or the skin sufficiently large to make an issue is destroyed, but by the diffusion of the alkali a large slough is produced, which is of course followed by an equally large sore. To avoid this excessive action, the application of the alkali should always be checked before it has accomplished all that is desired, as we may be sure, for some hours after, the destruction will continue.

Other precautions must be observed, or the caustic alkali dissolves in the fluids of the tissues, and runs over a large surface, which it subsequently destroys. It is therefore desirable, as soon as the application is finished, to wash the surface with vinegar and water, and so to neutralize any of the alkali which remains on the surface of the skin. Another precaution is advisable in making any issue. Pieces of plaster with a hole in them the size of the desired issue, should be placed one over the other on the skin, and the caustic applied to the skin exposed through the hole, while the neighbouring parts are efficiently protected by the plaster.

The caustic, very slightly moistened, should be rubbed on the surface until it assumes a dull bluish look, and till the cuticle is softened, and easily rubs off. The further application should then be discontinued, and a poultice be applied, which helps to separate the dead parts and to ease the pain of the application.

The itching which accompanies many skin diseases may often be allayed by sponging the troublesome part with a solution of one of this group. A weak solution of the caustic salt, or of its carbonate is best. Such an application is often of extreme comfort to persons afflicted with urticaria or lichen, to whose skin may be applied, with a small piece of sponge, a solution of carbonate of potash or soda, containing a drachm of the salt to a pint of water.

A still better application is a solution of the same strength of cyanide of potassium, which has also a strong alkaline reaction.

The itching of many other eruptions, as of scabies, eczema, pruritus ani, and vulvæ, and prurigo from lice, is better treated by other applications, which are mentioned elsewhere.

The carbonates of the alkalies are employed either as soap, or in the form of ointment, in the treatment of itch, to remove the superficial and dead cuticle, and so to break up the burrows of the itch insect.

The removal of the scales of psoriasis may be facilitated by the employment of soap, on account of the alkali it contains.

In the treatment of eczema, a weak solution of the carbonate of potash or of soda finds much favour with some medical men. The author has no doubt of its great usefulness in the early and middle stages of the disease, when there is copious weeping from the red and raw surface; but as soon as the weeping has ceased, and especially when mere desquamation remains, other applications are preferable, and the alkali ceases to be of use.

The strength of the solution recommended by Dr. Hughes Bennett, is half a drachm of the carbonate of soda to a pint of water. The surface afflicted with the disease is to be kept constantly moist by a thin piece of lint, soaked in the solution, and the whole is to be covered with oil-skin, or with a piece of lint, on which simple ointment is spread. This, like the oil-skin, prevents evaporation, but is less "heating" than it, and so is more comfortable to the patient. A weaker solution is sometimes still better. This treatment is an instance of alkalies, as local applications, checking an alkaline secretion, as the fluid which so abundantly oozes from the eczematous surface has a strong alkaline reaction, and the effect of the application is to check very speedily the abundant weeping.

It must be admitted, however, that in some instances, the alkali appears to irritate the skin, which result may often be explained by the solution being used in a much stronger state than that recommended above. While this treatment is adopted, due attention must also be paid to the state of the digestive organs, and any irritation, such as that which depends on teething or worms, should be removed.

It is also often useful to wash the eczematous surface, when

moist and weeping, with soap and water, an application which in many cases checks the secretion, and often much allays the heat and irritation of the part.

It is inferior to the previous application, and may be used in conjunction with it. It sometimes happens that the alkali of the soap may be too strong if the skin is delicate, and then its application, unless very sparingly used, may do harm.

Pityriasis of the scalp may be very effectually treated with a saturated solution of borax in water. The head should be sponged with this several times a day. It at once eases the itching, and loosens the scales, and so cleans the head, while often, in a short time, the disease gives way, and yields to the treatment, although, unfortunately, it generally, after a variable period, returns again, an occurrence which happens when the disease is removed by other treatment. Should the pityriasis prove obstinate, and resist the above application, the glycerine of borax may be employed, and will often be found to be more useful, as it keeps the scalp continually moist with the weak alkaline preparation. This treatment is also useful in eczema of the ears and scalp.

An efficient treatment for acne punctata is to well wash the face, or other parts affected, with hot water and plenty of soap several times a day. The orifices of the sebaceous follicles are by this application kept open, and the accumulation of the secretion, which is abundant, is prevented. If the skin becomes rough, red, and painful by this treatment, it should, after each washing, be well rubbed with glycerine of starch.

The intertrigo so often met with about the buttocks of children, or in the folds of their skin when they are fat, or under the breasts of fat women, can be effectually treated by free ablutions, with the assistance of soap, which decomposes and removes the acrid, irritating secretions, and so permits of the subsidence of the disease. The parts should, after each washing, and when they have been carefully wiped dry, be smeared over with some greasy application, which, in the author's judgment, is to be generally preferred to a dry one, such as starch powder or oxide of zinc. Caustic potash, or soda are sometimes used to open

abscesses. It is stated by this method, scarring is prevented. Alkaline baths are often employed, but their action on the skin and its secretion is not yet satisfactorily determined; like acid or simple baths, they lessen the acidity of the urine.

Pityriasis of the face is often caused by the use in washing or shaving of a soap too strong in alkali, and it will often at once disappear if a milder soap is employed. "Compressed glycerine soap" may then be used.

A weak solution of the bicarbonate of potash, of the strength of a drachm of the salt to a pint of water, will be of extreme use as an injection to check leucorrhœa, when this is dependent on an increased secretion of the glands of the os uteri. This secretion is strongly alkaline, and this capacity of alkaline injections to check it, when abundant enough to constitute leucorrhœa, is another proof of the general proposition, made at the commencement of this section, that alkalies, applied locally, check alkaline secretions.

When the leucorrhœal discharge is clear, and like white of egg, or when it is lumpy, but not yellow, this injection will be found to succeed in checking it, even after the third or fourth application. When, on the other hand, the discharge is yellow, and consists of pus, the injection may fail to do any good, although, in many cases, when this yellow discharge is due to mere abrasion of the os uteri, if the injection be continued for one or two weeks, the yellow becomes changed to a white discharge, and soon even this ceases.

It will readily be seen that the success of this injection depends entirely on the application reaching and coming well in contact with the os uteri, the offending part, and to insure this, it is necessary to give full and careful directions as to its use. The patient should be directed to lie on her back, to raise the buttocks, by placing under them a pillow, and then to introduce the syringe as far as she conveniently can, and to leave the injection in the vagina for about five minutes. The injection should be used cold, and be employed twice or three times in the day. The same method should be employed when other injections are used in this disease.

The author thinks that, in many cases, this injection is to be preferred to an alum one, which often produces much soreness of the parts, and severe cutting or griping pains in the stomach.

Mouth.—We should expect, if the theory propounded at the beginning of this section be true, that these remedies would check the secretion from the salivary glands, as this has an alkaline reaction. But of their influence in this respect nothing is at present known.

Of the diseases of the mouth, the only one treated by any of the members of this group is aphthæ, in which the mucous membrane is covered with usually small, round, sharply cut superficial ulcers, covered with a pultaceous exudation. This disease is often treated with borax and honey, for which may be substituted the glycerine of borax. It naturally runs a short course, and in most cases gets well in a week or ten days when left untreated.

Stomach.—The action of this group on the stomach has been somewhat anticipated when we stated that alkalies possess the power to increase its secretion, and thus they may be used to promote digestion. It is obvious, however, that method must be observed in their employment, or the very contrary effect will result; as if given soon after a meal is completed, the alkalies will neutralize the acid of the gastric juice, and so very effectually retard and lessen digestion. That the alkalies may promote digestion, by increasing the quantity of gastric juice, it is necessary they should be taken a short time before the meal is commenced. The alkaline saliva which is swallowed at the beginning of a meal is highly useful in this way; although, as it must speedily be neutralised by the acids of the stomach, this action must continue for only a short time. Alkalies may very usefully be given in many forms of atonic dyspepsia, and in other diseases where there occurs a deficient secretion of the gastric juice.

The bicarbonate of soda is the salt most generally employed. It is usually combined with some bitter, which, by its irritating action on the mucous membrane, sets aside any slight irritative

changes at work in the mucous membrane, which hamper its functions, and check its secretion.

When, on the other hand, a patient complains of heartburn and acid eructations, these disagreeable symptoms may be at once removed by the exhibition of an alkali, as the bicarbonate, which neutralizes the excess of acid on the stomach. But it must always be remembered that such treatment is merely temporarily palliative, and that the alkalies thus employed really aggravate the disease in many cases, by determining an increased secretion from the mucous coat of the stomach at the next meal. No doubt acidity of the stomach appears sometimes to be permanently removed by a course of alkaline treatment; but the good which is observed to follow the employment of alkalies can, with greater probability, be ascribed to the tonic with which they are generally combined. Used for the above purpose, the bicarbonates are preferred, on account of their milder action, to the more caustic salts, while the acetates and citrates are neutral in reaction, and only become alkaline by decomposition in the intestines or blood. On account of their milder action, the employment of the bicarbonates can be continued longer than the more caustic preparations; but they have the disadvantage of giving off much carbonic acid gas, which may cause trouble from distension of the stomach. If it is desired to prevent this, magnesia, which is an alkali, and acts like this group, may be substituted if the bowels are confined, or lime water if they are relaxed.

Alkalies are apparently sedative to the stomach, at least they can often relieve the pain of disease of this organ. Liquor potassæ generally finds employment in such cases.

Those alkalies which only slightly irritate the stomach are employed in cases of poisoning by the acids, to neutralize the acid, and so prevent its further action on the tissues of the stomach.

In poisoning by metallic salts and alkaloids, the same salts, namely, the bicarbonates of the alkalies, may be used, as they precipitate the oxide of the metal or of the alkaloid, and so precipitate them in a very insoluble state. Magnesia is generally preferred for this purpose, as it acts as a slight purgative, and so expels the poison from the intestinal canal.

The substances contained in this group by their diffusion power, pass so readily into the blood, that but a little of them reaches far into the small intestines. Of their action on these, and on the organs which pour their secretion into them, but little is known, but we can conceive those secretions of an alkaline reaction to be affected in a double and contrary way, according to the time at which these substances are administered, and thus act on the stomach.

The secretion from the intestinal glands is alkaline, and hence, if the general statement made at the beginning of this section be true, acids applied to the orifices of their ducts should augment their secretion, while alkalies should have the contrary effect.

But we have seen that alkalies, given before meals, increase the secretion of the acid gastric juice, and so augment the acidity of the intestinal canal, and when so employed they should increase the biliary and pancreatic secretion. On the other hand, the alkalies, if given after a meal, neutralize the acid in the stomach, and should then lessen the secretion from the liver and pancreas. On these questions nothing is known with any certainty. The above statements are, at present, mere conjectures. The milder alkalies, as the bicarbonates of potash, soda, or magnesia, may be used with great benefit in diarrhœa, which is owing to excess of acid in the intestines. These substances neutralize the excess of acid, when the diarrhœa generally ceases.

Soap is often added to injections for the intestines, and then helps to suspend castor oil or turpentine, if these substances are employed. Soap may, moreover, be used as a mild and safe purgative. A piece, the size of the thumb, may be covered with castor oil or merely wetted with water, and thrust up the rectum as high as the finger can carry it. In a short time an easy, copious, and natural evacuation is obtained. This is an especially useful application for infants and children.

On their entrance into the blood, these substances undergo different changes, according to their composition. The acetate or citrate, which has not already undergone a similar change in

the intestines, is converted into the carbonate, into which form the oxides of the alkalies probably also ultimately pass.

The alkalinity of the blood must therefore be heightened by these alkalies, but probably not to a very great degree, as they are, from their high diffusion power, rapidly separated from the system by the kidneys. On this increase in the alkalinity of the blood, much conjecture has been built. The alkalies are known to promote oxidation, and it has been conjectured that by increasing the alkalinity of the blood, the oxidation of this fluid and of the tissues may be increased. It has been suggested that alkalies might be employed with profit in diabetes, by promoting the oxidation of the sugar, and so preventing its separation from the system. Their employment has also been advocated when there occurs in the urine an excess of uric acid, with the expectation that this product of the nitrogenous tissues may be oxidized, and so converted into urea or some other substance. And for the same purpose, namely, to increase oxidation, they are sometimes given to fat people, in order to increase the consumption of their fat, and so to prevent unseemly stoutness.

The solutions of the oxides, or the bicarbonates, are used for this purpose, but especially the former.

Their action in diabetes appears to be nil, or rather, it should be said, they do not in any way lessen the amount of sugar separated by the kidneys, although, if long continued, there must occur some derangement of the stomach, and so with diminution in the appetite, less food is taken.

Neither does it appear that they can cause the oxidation of uric acid in the blood, at least, there are no experiments to prove this action at present recorded. It is, however, of much service to make the urine weakly acid, or even alkaline, when it contains an excessive quantity of uric acid, as this is then converted into a urate, and made more soluble, and by this treatment an increase in the growth of uric acid calculi may be prevented.

Again, with young male children it not unfrequently happens that micturition causes them severe pain, which, on examina-

tion of their urine, is seen to depend on the existence of uric acid or biurates, in the form of spicular crystals, which, in their passage along the urethra, irritate it. These can be dissolved and rendered innocuous by making the urine alkaline.

The salts best suited for rendering the urine less acid, or even alkaline, are those which have very little action on the mucous membrane of the stomach, and hence the citrates are to be preferred in such instances.

Next, as to the power of alkalies to increase the oxidation of fats. That by the long continuance of the more alkaline preparations, much wasting of the body may be accomplished, admits of no doubt, but this wasting they accomplish by disordering digestion from their action on the mucous membrane of the stomach.

It is highly undesirable to obtain wasting in this way, as at the same time the health is very considerably injured, and life may be endangered. It is maintained, however, by some writers of authority, that a diminution in fatness of the body may be accomplished without any such effects occurring in the mucous coat of the stomach. Thus, Dr. Neligan states that he has used the liq. potassæ in obesity, and has removed in many people their uncomfortable condition, without in any way injuring their general health. This treatment, though possibly occasionally successful, in the hands of most persons has most thoroughly failed, and has often considerably injured the stomach and impaired the health.

What action these substances, after their passage into the blood and their conversion into carbonate, exert on that fluid is at present but little known. Dr. Garrod is of opinion, that scurvy is due to a deficiency of potash-salts with the food; a surmise, which though corroborated by many facts, has not yet received confirmation by exact observation.

The bicarbonate, or the citrate of potash is often employed in rheumatism. This disease is supposed to be produced by an excessive formation of lactic acid, which having an affinity for some of the tissues of the body, attacks them, and excites in them the rheumatic inflammation. It is hoped by the employment of alkalies, to neutralize this acid, and to protect the tissues from its action. But so little is known about the nature of

rheumatism, that it is impossible to approach the question of its treatment on its theoretical side, and our answer respecting the usefulness of this method, must be alone decided by experience. But here great difficulties are met, as there are no careful records of exact observations with this treatment, and we can at present only refer to individual impressions. This much must be conceded, that in many cases the pain of rheumatism is much relieved as soon as the patient is well under the action of the remedy, and when the urine becomes fairly alkaline.

There are many eminent authorities who are firmly convinced that the disease, when treated by alkalies, is made both milder and shorter, and the danger of heart complications much less. The author has made many careful observations on this question, and he is led to believe, if due attention be paid to the age of the patient and to the nature of the rheumatism, it will be found that these salts have no power to lessen the height or the duration of the fever. In treating rheumatism in this manner, it is considered desirable to make and keep the urine alkaline. This can generally be accomplished by 30 or 40 grains of either the citrate or bicarbonate of potash, taken every two hours.

Potash salts are very abundant in the milk, and it has been suggested the administration of such salts may promote this secretion. They are also recommended by some in amenorrhœa, in syphilis, and scrofula.

By the long administration of the alkalies and their carbonates, it is said the blood becomes poorer in solids and in red corpuscles, and the nutrition of the body is much impaired. These occurrences are most probably due to the disorder of the digestion which alkalies, by their long use, produce, and are not dependent on an excess of alkalinity of the blood, for such excess must always be slight, on account of the rapid elimination of these salts by the kidneys; and, moreover, it has been shown by Dr. Roberts, of Manchester, that the citrate of potash may be taken for an almost indefinite time without the production of any derangement of the general health, yet the citrate increases the alkalinity of the blood, while by its neutral reaction, it is without effect on the stomach.

Liquor potassæ is reputed to possess the power to promote the absorption of inflammatory formations, and so finds an occasional employment in pleurisy. But its good effects are not very conspicuous, and the disorder it produces in the stomach renders it unadvisable to continue its use for any length of time.

What influence have the alkalies on tissue change? The action of liquor potassæ has been investigated by Dr. Parkes, who concludes it to be probable that this medicine increases the disintegration of the nitrogenous substances of the body, and he believes that his experiments justify him in asserting that it also disintegrates the sulphur-holding tissues, for when liquor potassæ was administered, both the urea and sulphuric acid of the urine were increased.

Action on the Urine.—This they render in proportion to their dose, either less acid or even alkaline. Liquor potassæ, from its strong reaction, cannot be given in sufficiently large doses to affect in any great degree the reaction of the urine, and when it is desirable to make this fluid alkaline, the bicarbonates or citrates must be employed.

What action have they on the constituents of the urine? They are all reputed to be diuretic, but this is at present only an impression, although probably a correct one, as no exact observations have been made with these salts.

Before we speak of the diuretic properties of these substances, it will be as well to digress for a short space, and speak in general terms of diuretics.

By diuretics we understand, medicines which act as eliminators of the urine, and we must distinguish them from those medicines which cause an increase in one or other of the constituents of the urine by promoting tissue change. Diuretics merely separate from the system already existing products.

As the urine is a complex fluid, and contains, besides water, many salts and other ingredients, we may have medicines which shall eliminate one or more of these, but leave the rest unchanged. We may therefore have diuretics of water or of urea, or of uric acid, &c. Then again, the retention in the blood of materials which should be eliminated by the kidneys, may

be due to a variety of conditions. The physical state of the kidneys may be altered and these organs disabled by disease of organs distant from them, as of the heart. Or on the other hand, there may occur insufficient oxidation and combustion of the effete products of disintegration, and so these materials may remain in a form in which the kidneys do not possess the power to excrete them; and, lastly, the retention of the urinary ingredients in the blood may be dependent on organic disease of the kidneys themselves.

Thus, on one occasion a medicine which shall act on some organ at a distance from the kidneys, as the heart or lungs, will be a diuretic; while on another, those means which promote oxidation in the blood, will become diuretic; and, lastly, diuretics may act immediately on the kidneys by removing or altering those physical conditions which hinder the action of these organs.

How far do the members of this group act as diuretics, and in which of the above ways? We cannot give very satisfactory answers to these questions.

First as to their diuretic action.

It is generally held that all these substances are diuretic, and, under different circumstances, they may act so. Acetate of potash and acetate of soda enjoy the highest repute in this respect. With these substances some careful observations have been made on persons in health, which have led to unexpected results. Thus it was found by Böcker (quoted by Parkes), "that so far from acting as a diuretic in health, the acetate of potash diminished the water, the urea, the extractives, and, in a remarkable manner, the earthy salts."

But should we expect medicines to act as diuretics or eliminators to persons in health? In such there should be but little urea or uric acid in the blood to be eliminated, and we must be careful, therefore, how far we allow experiments made on healthy people to guide us in our opinion of the action of these remedies as diuretics in disease. That such a caution is highly necessary is shown by an observation by Ranke, in which there occurred, after the employment of acetate of potash, a very considerable increase in the quantity of urine voided soon after, and which

observation certainly shows that circumstances may occur in which this salt can act as a diuretic of water.

Having now spoken of their properties as diuretics, an answer will be given to the second part of the above question:—In what do they act as diuretics?

It is not supposed that any of the members of this group can act as diuretics by their action on the organs remote from the kidneys. It is possible they may act by promoting oxidation in the blood, and so bringing effete products to the form of urea, in which they are separated by the kidneys.

Some of these medicines are considered to be febrifuge. This is the case with the citrates and acetates; and if they possess this power, they then would act as eliminators of water, as there occurs usually on the decline of fever an increase of the urinary water which was formerly held back in the system during the febrile state, and at the same time, there often occurs an increase in the solids of the urine. If, therefore, these substances can arrest fever, this increase of water and solids must, in some measure, be due to their action.

These alkalies are generally reputed to act as diuretics when the kidneys are themselves diseased. Thus, the citrates and acetates are given in acute and chronic Bright's disease. It is considered by some that, by making the urine alkaline, it is enabled to dissolve the organic, but diseased, matters which block up the uriniferous tubes in Bright's disease, and which hinder the secretion of the kidneys.

It has already been mentioned that, by the members of this group, the urine is rendered less acid, or even alkaline; but, we may here add, that, strange to say, the amount of acid excreted with the urine is actually increased, although, as it is neutralized by the alkalies which have been administered, it gives no acid reaction.

Of these remedies, the citrates and bicarbonates are constantly employed to make the urine alkaline, when the urinary organs are irritated or inflamed. They are so used in cystitis and gonorrhœa. If with the former disease the urine is already alkaline from decomposition of the urea before it is passed, the em-

ployment of the alkalies must be abstained from, for they would, of course, then increase the alkalinity of the urine, and so promote still further the decomposition of urea, and the formation of carbonate of ammonia, as alkaline decomposes much more readily than acid urine.

When there occurs in the urine an excess of uric acid, it should be kept for a time alkaline; and Dr. Roberts, of Manchester, has shown, by many careful and ingenious experiments, that uric acid calculi may probably be dissolved in the bladder if the urine be kept constantly alkaline for some weeks.

We may here introduce a short account of some interesting experiments made by Dr. Paul Guttman on the action of potash and soda salts.

He confirms many of the conclusions arrived at by Claude Bernard and others.

The results are singular, and scarcely in accordance with the experience of medical men of the action of these substances on the human body. We give a short summary of his paper:—

On Potash Salts.—All potash salts are far more poisonous than soda salts.

All potash salts are equally poisonous and fatal in the same time, if applied in the same way.

Chloride of potassium, carbonate of potash, and nitrate of potash, are equally powerful to destroy life, and in the same time.

This was the case even when the salt was, previous to injection, mixed with a solution of albumen.

The acid of the salt plays no part in the fatal result.

In poisonous doses, there occurred great muscular weakness, which first appeared in the hind extremities; while in warm-blooded animals there also occurred dyspnœa and convulsions. Their action on the heart was to lessen the frequency and force of its beats, and sometimes to make them irregular. This occurred with all potash salts.

Large doses arrested the heart's action at once, which always ceased to act in the diastole.

Traube has asserted that the action on the heart was accom-

plished through the influence of these salts on the vagi nerves. This view Guttman considers to be wrong; as, after the vagi were both divided, and the medulla removed, the potash salts still influenced the heart as before, and even when the vagi were paralysed by woorali, the potash salts still acted as usual on the heart.

Whether their effect on the heart be owing to their action on the heart's substance, or on its ganglia, Guttman cannot say.

He states these salts lowered the temperature of the body (but this certainly was insignificant).

They act but little on the muscles, and not at all on the peripheral nerves, unless applied in a strong form directly to them. The loss of sensibility and motion is due to their action on the spinal cord, whose functions they paralyse. Their action is first seen and most expressed on the posterior part of the cord.

Action of Soda Salts.—In twice or three times the quantity in which the potash salt proved fatal, these produced no effect on the system, except a passing weakness.

These salts, even in large doses, have no action on the heart, neither do they cause any diminution in the temperature, or produce any apparent effect on the cord, or brain, or nerves, or muscles.

The heart of a frog suspended in a solution of potash quickly ceases to contract, while, to arrest its action, a much longer time is required by a solution of soda of similar strength.

Many soda salts produce, when administered to frogs, an opacity of the lens. This is not noticed to occur with the sulphate of soda. Guttman shows that the opacity is not due to mere abstraction of water from the lens.

Such opacity does not occur in mammiferous animals. It is removed by immersing the opaque lens in water.

SOLUTION OF AMMONIA.
CARBONATE OF AMMONIA.
SPIRITS OF AMMONIA.

These preparations have many properties in common with the alkaline potash and soda group.

They possess a strong alkaline reaction, are freely soluble in water, have a high diffusion power, and are soluble of the animal textures, but they differ from the potash and soda preparations in being very volatile, and are much more powerful irritants of the living animal tissues, as they excite in these, when applied locally, very active inflammation.

Action on the Skin.—This is in many respects similar to that of the alkaline potash and soda preparations. As the ammonia is already dissolved in a considerable quantity of water, it has but little attraction for that of the tissues, and as its solvent action on the textures is less than that of the soda or potash salts, it physically destroys these much less quickly and extensively. Owing, however, to its high diffusion power, it readily penetrates the cuticular covering of the body, when by its irritant properties, it excites such active inflammation, that this may destroy the tissues and so produce, first a slough and then an ulcer. The preparations of the members of this group are never employed to produce such serious changes in the tissues, but, in the form of liniment or the solution of ammonia itself, are used as vesicants and rubefacients.

The strong solution may be employed when it is desired to produce, very speedily, vesication. The following is the way to proceed:—A few pieces of lint are to be cut a little larger than the size desired in the blister, and on these ten or twenty drops of the strong solution of ammonia are to be poured. This is to be immediately applied to the skin, and the whole covered by a good sized watch-glass. Feeling of heat, with some smarting and tingling, is soon experienced, and in a short time there is observed a rim of redness around the glass. When this is decided,

the application should be removed, and a poultice applied in its place, which promotes the vesication, while at the same time it eases the burning pain. In this way a blister may, with many persons, be produced in ten minutes; with others, it takes half an hour; but so great is the difference observed in persons in respect of the action of ammonia on their skin, that with some a blister is not formed at all. It must be considered a very uncertain application as a vesicant.

As a rubefacient, or counter-irritant, it finds a wider and more useful application, although for this purpose it is in no way superior to a mustard-poultice, and as the materials for the preparation of the last-named application are always at hand, it finds a much more constant use than the ammonia liniment. When employed as a counter-irritant, the liniment of ammonia will act very imperfectly, if it be merely rubbed or dabbed on the skin. It must be applied on lint or linen, and this must be kept in contact with the skin, when, in a few minutes, decided rubefaction is obtained.

As a counter-irritant, it is used for the same purposes as mustard-poultices or blisters, and we must here refer our readers to the sections on these remedies. The weaker solutions of ammonia are sometimes applied to the bites of insects, as wasps, spiders, &c., to prevent the irritation of their poison. The active principle of this poison is formic acid, which is neutralized by the ammonia, and so made inert.

Salts of ammonia are commonly used as restoratives in fainting, and in poisoning by the narcotics, when they are applied to the nose and breathed into the air passages, which they irritate, and so rouse the person to consciousness. In the same way they are used in the early stages of colds in the head, or as derivatives to remove pain and inflammation of the nose and frontal bones. Ammonia inhalations have been recommended in chronic bronchitis to ease the expectoration from the bronchial tubes, when this is abundant, and probably to lessen it also. Its employment in the hands of some medical men, appears to have been rewarded with success.

In the Stomach.—It acts much after the manner in which it

affects the skin. As an alkali, it neutralizes, as far as it can, the acid it meets, and is hence an antacid. At the same time, if not wholly neutralized, it acts as an excitant, or even irritant of the mucous membrane.

There is experienced soon after its administration, a feeling of warmth at the pit of the stomach, which soon spreads to the rest of the body. As an excitant of the stomach and upper part of the intestines, it may be used when, from exhaustion or weakness, the functions of these parts are depressed, but it is inferior in this respect to brandy or wine. From the same action on the intestinal canal it often sets aside any spasm with which they may be affected, and also braces up the mucous membrane when this is relaxed. Ammonia compounds of this group are therefore among the best anti-spasmodics. They are especially useful with children, who, in their younger days, are frequently much tormented by colic or flatulent distension of the intestines, generally owing to bad feeding.

It will be often found, that spirits of ammonia more effectually relieve these spasms than other remedies.

These preparations may also be most profitably employed in the after-stages of diarrhœa, when the irritating excitant cause has been removed, and when the mucous membrane continues to pour out a watery secretion which perpetuates the diarrhœa.

The alkaline preparations of ammonia have been recommended and employed in flatulent distension of the stomach and intestines, with the view to absorb the excess of gas which often consists of carbonic acid.

That these remedies are often temporarily useful in these affections there is no doubt, but the good effects depend on their exciting the muscular coat of the intestines to contract, and so promote the expulsion of the distending gases. They are in such cases merely remedial, and not curative.

If given in full doses, these remedies excite an increased formation of mucus, and even produce vomiting. As emetics, their effect is accomplished without nausea or depression. They are not employed for this purpose alone, but are added to other emetics to prevent the depression these usually cause, and if the

patient is much weakened, or very prostrate, then ammonia salts act as stimulants.

Long continued, they excite catarrh of the stomach and intestines.

These substances readily enter the blood, and must, to some extent, increase its alkaline reaction; but from their volatility and high diffusion power they are rapidly eliminated, and hence their action on the blood and the organs of the body is a very transient one.

What effect it has on the blood is at present unknown. It has been stated by Dr. Richardson to prevent the spontaneous coagulation of this fluid; but subsequent observers have shown this assertion to be incorrect. It has also been thought that carbonate of ammonia is the poisonous agent in uræmia; that the urea decomposes in the blood, and forms this carbonate, which, in its turn, produces the serious symptoms which constitute uræmic poisoning. This view is more than doubtful.

After their use there is experienced a slight increase in the force of the pulse, with some excitement of the brain, and a general feeling of warmth.

They are thus slight stimulants of the heart, and are used on account of this property in fainting and exhaustion, but are in no way superior to alcoholic stimulants; while, owing to the greater readiness with which they find an exit from the body, their effects are far less enduring. They are frequently administered as antispasmodics—an action very probably depending, in part, on their power to strengthen the heart's action, but, like all other antispasmodics, their influence is but a short one, and unless given in increasing doses, these remedies soon lose all their power in this respect.

Sesquicarbonate of ammonia is often employed as a stimulating expectorant, and is given when in chronic bronchitis the expectoration is profuse, and when the strength of the patient is growing less. It is often given with hydrochlorate of ammonia, and probably acts in a similar manner. It is esteemed highly by some in scarlet fever. These salts are reputed to be diaphoretics, and may, in virtue of their property to increase the circu-

lation of the blood, act in this way. A full dose of spirits of ammonia is often useful in restoring reason and steadiness to drunken people. Its action is speedy, and generally sure. The supposed power of these remedies to prevent iodism, when salts of iodine are given, has been mentioned at another place.

These substances escape from the body in different ways, and from their high diffusion power, this is with them an easy matter. Part issues from the body with the breath, some probably with the sweat, and much with the urine.

MAGNESIA.
LIGHT MAGNESIA.
CARBONATE OF MAGNESIA.
LIGHT CARBONATE OF MAGNESIA.
SOLUTION OF CARBONATE MAGNESIA.

These substances have an alkaline reaction, and might, on this account, be placed in the group of potash and soda alkalies. In most other respects they have a very different influence on the body. It has elsewhere been stated the properties which pertain to all alkaline substances, and, of course, to the members of this group, in consequence of their alkalinity. (See Potash Group.)

Skin.—They are never used as applications to the skin.

In the stomach they are variously affected. Some of the oxide combines with the acids it meets in this cavity, and is so made soluble; the remainder is unaffected, and is left insoluble. Part of the carbonate is, by the acids of the stomach, decomposed, and the carbonic acid set free.

In the stomach they may act as antacids; and as antidotes, in poisoning by the strong acids, and by some metallic salts.

As antacids they are useful where such remedies are required. In some cases they are preferable to bicarbonate of soda or lime. The advantages of the members of this group are:—I. Their large saturating capacity for acid. II. Their purgative property.

III. When given in excess they do no harm, on account of their insolubility.

Their disadvantage consists in their great bulk. As antacids, the oxide or carbonate of magnesia is generally used; but the oxide is preferable, as the carbonate gives off much gas, and this may produce disagreeable distension of the stomach.

As such they are merely temporarily remedial, and it must not be forgotten that, in acids, we have far better remedies for acidity of the stomach. (See Acids.)

The oxide of magnesia may be conveniently used as an antidote to the strong mineral or vegetable acids. It neutralizes these and protects the delicate structures of the stomach from their corroding action. Many metals are also by it precipitated from their acids, and rendered less soluble, and so less poisonous. With arsenic, they form an insoluble compound, and thus the members of this group rank among the antidotes of this poison. (See Arsenic.)

From the stomach the members of this group, or the salts they have formed with the acids of the stomach, pass on to the intestines, and but little find their way into the blood from a double cause, namely, their insolubility, and their low diffusion power.

In the intestines they suffer changes, the oxide is first converted into the carbonate, and then into the bicarbonate by the carbonic acid of the intestines, and so made soluble, and by this means it acts on the intestines as a purgative. The carbonate is in a similar manner changed into the bicarbonate, and so becomes active as a purgative.

As we have said, it is only after they have become bicarbonates that they act as purgatives, in which form they have most of the properties of the group, which contains sulphate of magnesia, &c. Like them, the bicarbonate has a very low diffusion power, and, like them, it is purgative. As its action in this respect, however, is very mild, it is termed a laxative. The mild action, freedom from taste, and antacid property of these substances admirably fit them for children. They are generally combined with a little rhubarb. If employed for some time, these substances occasionally accumu-

late in the intestines, and form concretions of ammonio-magnesian phosphates.

Magnesia has been praised for its good effects in sympathetic vomiting, as of pregnancy, it is to be presumed when the vomiting is dependent on an excessive secretion of acid from the stomach.

Of these substances which enter at the mouth, the chief part passes out again with the fæces, and only small quantities, for the reasons stated, enter the blood. They are not employed on account of their action on the distant organs of the body. By saturating much of the acid in the stomach, and carrying this out of the body, this group can lessen the acidity of the urine, and so proves useful when there is an excess of uric acid in the urine.

LIME, CAUSTIC LIME, LIME-WATER, LINIMENT OF LIME, SACCHARATED SOLUTION OF LIME, CARBONATE OF LIME.

This group contains substances most valuable in medicine, and whose application in disease might be much more extensive than it at present is.

Thus lime is a necessary constituent of the body, both of its hard and soft tissues, both of bone, and those more vitally endowed parts, as the nerves and muscles; wherever active growth, whether natural or unnatural occurs, there lime salts are found in excess, perhaps as the phosphate, which is probably the form required by the body for the performance of many of its functions. But although this last statement may be true, yet in practice we find the salts of this group of great service in almost precisely the same states of health in which the phosphate is so valuable, and it is possible they may after their entrance into the body be in part united with phosphoric acid.

It will be convenient to mention in this place a few of the properties of this group, which must influence and explain their action on the body. As their diffusion power is very low, and as they have but little affinity for animal structures, they produce

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very little change when applied to the entire skin. But as the caustic lime has a strong attraction for water, it can withdraw this from the dermis when it is robbed of its cuticle, and so accomplish to some extent the destruction of the tissues with which it is in contact. Yet, as its diffusion power is slight, it cannot penetrate the tissues, and consequently its action is a very superficial one. The caustic lime is not often used as an escharotic. It is sometimes mixed with caustic potash, when this is applied for that purpose, which mixture is less deliquescent than the simple caustic potash, and is hence easier and safer of application.

To the broken skin and sores the carbonate and lime water are slightly astringent, and the latter is sometimes used on account of this property to check the discharge from sores and eruptions of the skin.

Lime-water with oil, in equal quantities, or in the proportion of four of the former to one of the latter, enjoys a high reputation in the treatment of burns.

Cracked nipples are sometimes improved by the employment of lime-water as a lotion.*

Lime-water is sometimes employed to check the abundant discharge of some skin diseases as eczema. It is found to act at the same time as a sedative, and eases the smarting and tingling which may be present. In eczema where the discharge is great, but the inflammation has been subdued, lime-water and glycerine can be applied with benefit and comfort.

Carbonate of lime is sometimes used as a dusting powder to the skin when it is the seat of eczema or intertrigo. The object of its application is to absorb the abundant secretions from the sore, and to prevent discharges of any kind from irritating the already

* But these should always, if possible, be prevented, which is much easier to accomplish than their cure. To ensure their prevention, the nipple should be carefully washed and dried immediately the child is removed from the breast, and the tissues may be hardened by washing them some short time before delivery, and after each application at the breast, with a little brandy and water. It is also a useful practice to wear over the nipple a metallic shield, which should be constantly applied when the child is not at the breast.

inflamed skin, and also to protect the disease from the influence of the air. For these purposes it, in common with other dry powders, is, in the author's opinion, inferior to some simple, bland, or slightly irritating, greasy application. There are, however, cases which are certainly more benefited by dry powders, as oxide of zinc, bismuth, and carbonate of lime, than by the ointments.

Carbonate of lime, as we have said, is used for intertrigo of the buttocks and perinæum of young children, to protect the skin from the irritation of the urine and of the air. As the irritation of cloths wet with urine is very generally the cause of this eruption, it can easily be understood this protection can be far more efficiently performed by greasy applications, as the powder readily absorbs discharges, and then itself irritates the skin, and also cakes and cracks, leaving parts of the skin exposed. Frequent ablutions with soap and water, with greasy applications between, will be found most generally the best treatment of this disease.

Lime-water, on account of its astringent powers, may be used as a wash in discharges from the ears and vulva. It is of most use when there is still some active inflammation present. In the chronic stages of the former disease it is far inferior to the glycerine of tannic acid, and other astringents.

Lime-water is often useful as an injection for leucorrhœa. Its power to check the discharge is probably explained by its alkalinity.

Mouth.—Carbonate of lime makes a good tooth-powder, and for this purpose is to be preferred to those powders whose particles are hard and angular, by which properties they wear away the enamel, and lay bare the dentine of the teeth.

Lime-water is occasionally used to lessen the discharge, and promote the healing, of inflammatory and ulcerative diseases of the mouth.

Stomach.—These substances, in proportion to their quantity, neutralize the acid they meet in the stomach, and are hence antacids; they may be employed for this purpose, but mostly other remedies are preferred. These salts of lime are useful in poisoning by oxalic acid.

Few remedies are more useful in some forms of vomiting than lime-water. At present, it is difficult to lay down precise directions as to the diseases in which it will be found serviceable.

It is very generally useful in chronic vomiting, and may be tried should other remedies fail. It is often successful in arresting the vomiting of chronic ulcer of the stomach. It should be mixed with milk, either in equal parts, or in the proportion of one of lime-water to four of milk; and if the vomiting be incessant, the patient should be fed on this alone, small quantities as a tea or tablespoonful, being frequently administered. In the following form of vomiting lime-water is most excellent. Young children not uncommonly eject much of their milk in large lumps. This vomiting is generally at once stayed if thus treated; or if it still continues, the rejected milk is no longer curdled. As much as one-eighth of lime-water to the milk is generally sufficient. Again, in young children who suffer from chronic vomiting and diarrhœa, and who, in consequence, are much wasted, lime-water often acts with the greatest benefit. It improves their digestion and apparently also their power of assimilation, and also removes—what is generally present in such children—the highly irritating state of the urine, and in this way indirectly cures the child of intertrigo if this has been excited by the previously acrid urine.

Solutions of these salts, on account of their low diffusion power, pass but slowly into the blood, and so it happens the greater part of them are carried from the stomach through the intestines, and are ultimately voided with the fæces.

Intestines.—In the intestines these substances neutralize any acid present there, and also check the secretion from the mucous membrane, and sometimes by the one means, and sometimes by both, act as astringents in diarrhœa.

Carbonate of lime, and, to a less degree, lime-water, deservedly hold a high place among remedies for diarrhœa. They are useful in the latter stages of this complaint, when the irritant which has started the disease is either removed by nature, or expelled or neutralized by medicine. Common chalk mixture is also useful in the diarrhœa which depends on more serious

causes, as ulceration from phthisis or typhoid fever, but other remedies are to be preferred in these diseases.

Lime-water is reputed to be of use in whooping-cough, and such, indeed, may be the case from its astringency, for there occurs in certain forms of this disease a decided improvement after the employment of astringents, such as alum and tannin.

Lime-water may be used with success as an injection into the rectum to destroy those small thread worms which infest this part of the canal. It has also been used as an injection in gleet.

Blood, &c.—From their low diffusion power only a small quantity of these substances can pass into the blood; and so small, probably, is this quantity, that it might be thought they could in no way influence the organs of the body remote from the intestines. But experience certainly appears to decide against such a conclusion; for, after the employment of lime-water, or carbonate of lime, we see great improvement in persons who have suffered from deficient nutrition, and who are convalescent from serious disease. Their good effects are most visible in children, and they certainly appear to be of great service in some stages of rickets, or in children who suffer from malnutrition, &c.

In some instances, these good results can be traced to the action of the lime-salts on the mucous membrane of the intestines; but such is not the case on all occasions. As, however, the action of these lime salts appears to be very similar, although inferior, to phosphate of lime, we refer our readers to the section which treats of this salt. One circumstance may be noticed here, which both theory and experience confirm, that as but little of these substances can pass into the blood, as much good may be obtained from small as from large doses, where it is desired to obtain their influence on the remote organs of the body.

PHOSPHATE OF LIME.

This salt is of very great importance, both in health and disease, and must be ranked among the most valuable and necessary foods, being probably as essential to proper growth and nutrition of the body as the nitrogenous and fatty foods.

Observations have abundantly proved its physiological importance. It is well known to give solidity to the skeleton, and if the quantity supplied to the body be small, or if the demand for it be greater than the supply, these solid structures suffer and become soft. Chossat produced softening of the bones of animals fed on food free from lime-salts; while, during pregnancy, much phosphate of lime is required for the ossification of the skeleton of the fœtus, and it is found that fractured bones of women in that condition unite but slowly and imperfectly.*

Some experiments by Milne Edwards, bear practically on this point. He found the bones of animals, which were intentionally fractured, united more quickly if the animals were made to take phosphate of lime.

These experiments indicate the usefulness of this salt in promoting the union of broken bones.

But the importance of this salt to the body is far greater than merely to give solidity to the skeleton, for it appears to be necessary to cell growth and natural nutrition. It is a necessary food to the soft and growing tissues.

This very probable supposition is supported by the following considerations:—

1. From its very general distribution throughout the body.

2. From its presence in much larger quantities in the intercellular fluid of the body than in the blood itself.

3. From the fact that in herbivora, the intercellular fluid is as rich in this salt as it is in carnivora, though they take so little of it into the body with their food, hence it must be carefully retained in the intercellular fluid for some important purpose.

* The urine of pregnant women is said to be very poor in lime-salts; the evidence on this point is, however, very discrepant.

(In respect to the remarks made in 2 and 3, it must be borne in mind, that as the intercellular fluid is acid, and phosphate of lime is soluble in acids, the phosphate would be expected to accumulate in this fluid.)

4. Schmidt's observations show, "that a certain quantity of phosphate is required to supply the first basis for the new tissues, even in the case of those organs which subsequently exhibit an excess of carbonate of lime," as the shells of animals, an observation which shows phosphate of lime is necessary to growth, and cannot, in this respect, be replaced by the carbonate.

5. Wherever cell-growth is active, there the phosphate of lime is in excess, and this holds true both in healthy and diseased growths; for in disease, where there occurs rapid formation, this salt is found to prevail.

Viewing the subject theoretically, it might be supposed we have here abundant knowledge to teach us on what occasions to employ this salt in disease. It would be assumed, that when we meet with defective nutrition, or deficient cell-growth, the phosphate of lime will be of service, and experience fully corroborates this conclusion. Certain theoretical objections may and have been urged against the employment of this salt. It has been said, that in the cases in which its administration is recommended, the fault is really not due to deficiency of lime supplied, but resides in the tissues, which fail to assimulate it. To support this view, it may be urged that in cases of defective cell-growth and of mal-nutrition, the quantity of the phosphate in the urine is unusually great; and, consequently, in such cases the efforts of the medical man should be directed to remove those causes, which check assimilation. It is as reasonable, it may be said, to treat diabetes with sugar, as a diabetes of phosphate of lime with phosphate of lime. There is, no doubt, much truth in this criticism, and too much attention in such cases cannot be paid to those circumstances which promote assimilation, as good air, abundant light, and sufficient exercise. Yet although this is true in part, it is not wholly so, for the case before us is rather analogous to anæmia than to diabetes, and we treat with decided benefit anæmia with iron, even where it is not due to want

of iron in the food, but to the non-assimilation of it by the tissues.

It is obvious, the usefulness of this medicine must be decided by experience, and this speaks abundantly in its favour. Beneké, to whom we owe much of our knowledge, both physiological and therapeutical, on the subject, has shown that the phosphate of lime is especially useful in those very diseases in which it occurs in excess in the urine, as hectic, and chronic disease accompanied by wasting.

This salt will be found of very great use in the anæmia of young and rapidly-growing persons, and to women, made weak by rapid child-bearing, or by prolonged suckling, or excessive menstruation. It is of great value for its power to check chronic tubercular and non-tubercular diarrhœa, and other profuse discharges, such as are met with in leucorrhœa, chronic bronchitis, and large abscesses, in all of which states it effects both a general and local improvement. Beneké greatly praises its influence on scrofulous sores. It is also useful in caries of the bones.

Women, who live in towns, have a deficiency of this salt, and so both they and their children, if they are suckling, suffer. The mother may be much benefited by this medicine, and, as an increased quantity then finds its way into the milk, the child is at the same time improved.

Both men and women, whose health has been broken by a too long residence in town, or by over-work, and who, from other causes, are languid and incapable of doing much work, and whose spirits are depressed, may be very much benefited by this medicine.*

The chronic forms of phthisis, with little or no fever, are well treated with this medicine. It should be taken either dry, on the tongue, or mixed with a little milk.

Of the important use of phosphate of lime, in many cases of rickets, the author thinks no reasonable doubt can be entertained.

* A good formula in cases like this is a grain of phosphate of lime, phosphate of iron, and carbonate of lime, but phosphate of lime will act admirably by itself.

It has been sought by some to establish, in all cases, a connection between rickets and a deficient supply of lime.

In favour of this view it is advanced that, I. The disease occurs most commonly during the first dentition, when much lime is required by the growing teeth. II. The disease occurs in the children of mothers in that condition of health in which it has been established a two small quantity of lime is present in their milk.

It is very possible there may be much truth in this conjecture, but as there occurs in many cases of rickets an excess of lime in the urine, the disease cannot be held in such cases to depend on a too small supply of the salt, but must then be due to other circumstances, with which we are at present only partially acquainted. In those cases where the disease is dependent on deficiency of phosphate of lime, its administration is obviously all that is required to check the disease.

In rickets, however, there is present, not merely deficient ossification of the bones, but also in them and in the other textures of the body, an unnatural growth and defective nutrition.

These circumstances the phosphate of lime appear to have the power to set aside, and replace them by healthy growth, and so not merely to increase the consolidation of the skeleton, but to improve the condition of the soft organs also.

Experience abundantly shows that very many rickety children may have their health restored to them more quickly, when this and other lime salts are given, than when other treatment is alone relied on.

It is considered by those German authorities who have most attentively studied this subject, to be of use only after the active stages of disease have ceased, that is, when the pains and tenderness of the bones have disappeared.

We may here state the uselessness of administering this or other lime-salts in large quantities, as from their very low diffusion power but very little passes into the blood, and most remains in the intestines. A grain or two grains, several times a day, is a sufficient dose.

Mouth.—It neither produces nor suffers any change in the mouth.

Stomach.—In the stomach it must be variously affected by the free acids it there meets, as by lactic, hydrochloric, and, in a lesser degree, by acetic acid, it is dissolved. In its turn, in large quantities, it hinders digestion by the gastric juice.

Intestines.—Most of the phosphate of lime taken into the stomach, passes from thence into the intestines, and may here, if its use be long continued, form concretions. As it is unaffected by the pancreated and biliary secretions, and is only slightly soluble in the intestinal juice, most of it passes off with the stools.

It is very highly recommended by some in different forms of chronic diarrhœa, and especially that of young children, to whom it may be given with some carbonate of lime and lactate of iron. Whether the beneficial effects which follow its administration be caused by its direct action on the mucous membrane, or whether it acts after absorption, in the manner previously described, our present knowledge does not enable us to decide.

Its passage into the blood can probably be secured in several ways, as it is soluble in the acids of the gastric juice, and, to some extent, in solutions of common salt. It has, however, been doubted if any of that administered uncombined with food, passes into the blood, as after its administration no increase of this salt is met with in the urine, nay, this appears in some cases even to be diminished. The observations on this point are, perhaps, too small to set the question at rest.

Much is taken either in combination with the food, or so intimately mixed with it, that it is almost impossible to separate it from the tissue-forming substances. So with the digested materials it finds a ready entrance into the blood, and this is the chief, and, in ordinary cases, the only source of phosphate of lime for the system.

In the blood it probably continues its combination with the albumen. Its solution in so alkaline a fluid as the blood, can also be explained by its solubility in solutions containing free carbonic acid or common salt.

HYPOPHOSPHITE OF LIME.
„ SODA.

These medicines have been very highly praised for their great usefulness in some forms of phthisis, and have found more favour with American than English practitioners. In America they are used in other diseases, besides phthisis, as "nervous and general debility." (See Phosphate of Lime.)

Dose, gr. ij. to gr. x.

CHLORIDE OF POTASSIUM.
CHLORIDE OF SODIUM.
CHLORIDE OF AMMONIUM.

As these substances have very many chemical and therapeutic qualities in common, they have been grouped together, but the remarks which follow in this section, refer mainly to chloride of ammonium.

These salts are freely soluble, and possess a high diffusion power, which properties must influence their action on the economy, for by the latter quality, they easily enter and escape from the body.

Mouth.—They have a saltish taste which, in the case of chloride of ammonium, is very disagreeable, and constitutes one of the objections to its use.

Stomach and Intestines.—They all increase considerably the secretion of mucus from this mucous membrane, and, indeed, do so from all the membranes of this class. They may even excite catarrh. This is notably the case with chloride of ammonium, which is consequently most employed when it is desired to influence these structures. Their power to promote the formation of mucus may, perhaps, be explained in the following way, and especially so in the case of common salt. This last-named substance is a large constituent of mucus, and, probably, when taken into the system in large quantities, it promotes the production of those secretions of which it forms a large part. It is, indeed, a

food to the mucous membranes. This same explanation may possibly apply to the other members of this group. These substances, and especially sal-ammoniac, is not uncommonly used to remove catarrhal conditions of the intestines, and to prevent the formation of the thick tenacious mucus not unfrequently seen in the intestines, and which forms an excellent nidus for the different worms that infest this canal. This salt will, therefore, in this indirect way, be a vermicide.

These salts, from their high diffusion power, pass rapidly into the blood, and hence reach too small a distance along the intestines to influence these, and act as purgatives. Thus, unless administered in very considerable quantities, they have very little influence on the character of the motions.

Common salt may be used to produce sickness, or to promote vomiting after other emetics have been given. It may also be used in poisoning by nitrate of silver, when a double decomposition occurs, and the silver is made harmless by precipitation, as the insoluble chloride.

The chloride of ammonium may be used often with considerable success in chronic catarrhs of the bronchial and urinary mucous membrane, but especially of the former.

Thus in chronic bronchitis, where the secretion is abundant and thick, this medicine is indicated.

In such cases, it may be applied topically to the diseased mucous membrane by the atomizer.

The same remedy has been praised for its influence over whooping-cough. It is also said to be frequently successful in removing the pain of facial neuralgia "of rheumatic character." It should be given in half-drachm doses, and, if relief is not obtained by four doses, the remedy may be considered unsuitable for the case, and be discontinued. These are the directions given, it is believed, by Sir T. Watson.

The same remedy, namely, chloride of ammonium, has been employed by some with advantage in head-aches, due to menorrhagia, amenorrhœa, &c.

Common salt is sometimes successfully given to arrest hæmoptysis. It should be taken undissolved, and in a dose of half a

teaspoonful at a time, and this may be repeated till nausea is produced.

Influence on the Urine.—Chloride of Ammonium.—Dr. Parkes, in his works, states, "muriate of ammonia is not oxidized, but passes out, unchanged by the urine." "According to Böcker, it increases (in health) all the constituents of the urine, except the uric acid, which it slightly diminishes. The mean daily increase of the urea in these experiments was 4·793 grammes, or 74 grains—an amount which indicates a vast augmentation of metamorphosis or of elimination. The volatile salts and extractives were increased by no less than 18·959 grammes, or 292 grains, which was, no doubt, partly owing to the presence of the volatile chloride of ammonium." (Parkes on Urine.)

Group containing—

SULPHATE OF POTASH.
SULPHATE OF SODA.
SULPHATE OF MAGNESIA.
PHOSPHATE OF SODA.
TARTRATE OF POTASH.
BITARTRATE OF POTASH.
TARTRATE OF POTASH AND SODA.

With a slight alteration we have adopted this grouping from Buchheim's excellent work on therapeutics, and in our remarks on the action of these medicines, we are largely indebted to the same authority.

With the exception of the sulphate and bitartrate of potash, these substances are freely soluble in water.

The sulphates, moreover, possess a very disagreeable bitter taste, which is but slight in the phosphate of soda, and is absent in the tartrates.

They are all purgative and produce watery evacuations, which action is probably explained by the very low diffusion power they possess.

They have little or no affinity for animal textures, neither any

powerful attraction for water, and so they affect very few changes in the organic constituents of the body.

Mouth.—Several of the salts of this group, such as the sulphates, possess a very disagreeable taste, which is sufficient with some persons to produce both nausea and vomiting.

None of these substances are employed as remedies in diseases of the mouth.

Stomach and Intestines.—They all act as purgatives, and produce watery evacuations, but excite very little irritation in the mucous membrane of these parts. How they accomplish their purgative effects will now be considered.

Purgatives may act in one of two ways, or in both combined.

Some succeed by increasing the moisture of the contents of the intestines, and so facilitate their passage along the canal; others act by increasing the peristatic action in the intestines, which more rapidly drives the contents to the rectum, whence they are expelled, while most combine both effects, although usually one action predominates over the other.

From the watery character of the motions after the administration of any of these medicines, there can be no doubt they in part, at least, purge by maintaining the moisture of the contents of the intestines.

This, again, can be accomplished in different ways. The medicine may cause water to flow from the blood into the intestines, or it may excite the mucous gland of this tract to increased secretion, or it may retain the water which is already present in the intestines. From Buchheim's careful observations, it appears that these medicines are purgatives in the latter way, in virtue of their power to retain in the intestines the water which they meet there, and that they do not act in any other way. That they produce no flow of fluid from the blood, and do not excite increased secretion in the mucous glands, he concludes from the fact that, after the exhibition of any of these medicines, there occur no albuminous substances with the fæces.

The way in which they retain in the intestines the water which they find there is thus explained. As we have said, these salts possess a very low diffusion power; that is, they pass with slowness and difficulty through animal membranes. This pro-

perty prevents their speedy transfer from the intestines to the blood, and they are thus long retained in the canal. As, however, they hold with some avidity the water in which they are dissolved, or meet in their course through the body, they prevent this passing from the stomach and intestines to the blood, and so the fluid in these cavities is retained. It is not generally held that any of this group act as purgatives, by increasing very considerably the peristaltic contraction of the intestines, a conclusion built on the fact that none of them produce much pain and griping. From what has preceded it will be gathered that these medicines are mere eliminators from the intestines, and are not so of the effete matters which may be present in the blood, although by accomplishing the former they prevent this important fluid becoming contaminated by any of the products of decomposition of the fæces.

An excellent way to administer some of these salts is in the form of Pullna or Friedrichshall waters. They may be given in a dose varying from a wineglassful to half a tumblerful, according to the circumstances of the case.

Usually one dose before breakfast is sufficient; if not, a second, and even a third, may be taken in the course of the day. It is advisable to mix the natural water with an equal quantity of warm water; for if used cold, they are liable to "lie heavy on the stomach," and to produce much discomfort. Usually a wine-glassful of Pullna water, with an equal quantity of tepid water, will be sufficient to open the bowels without much griping or pain. These natural waters are excellent purgatives.

The different medicines of which we are now speaking are not all equally used in the same diseases. The bitartrate of potash is employed in both general and local dropsies, and more frequently in the former than the latter, and is especially used as a hydragogue cathartic in Bright's disease. It is then given to withdraw from the system its superfluous water, and to prevent this accumulating to a dangerous degree in the cellular tissues, or in the cavities which contain the important organs, as the heart and lungs. It is also used to draw off with the water the effete and poisonous matters which, in this disease, are retained in the blood. As

these remedies are mere eliminators from the intestines, it may be thought they cannot withdraw either water or urea from the system; but a little reflection will show us this is not the case.

During digestion a very considerable quantity of fluid is poured into the intestines by the stomach, the liver, and the pancreas, which fluid, if the blood contains poisonous matter, carries these in part with it. These medicines hold back and retain much of this fluid in the canal until it is expelled through the anus, and so diminishes the quantity of fluid of the body, and removes, at the same time, some of the poisonous matters accumulated in it. So far theory speaks. When we put aside such considerations, we find experience tells the same tale, as the concurrent testimony of medical men bears witness to the fact that, by freely purging with bitartrate of potash, or by other members of this group, the fluid in the cellular tissue and cavities of the body is lessened, while the coma, convulsions, and other symptoms which are due to the poison in the blood are also often removed. It must always be borne in mind that free purging is very weakening, and so this treatment must be adopted with caution.

It may be here conveniently stated that a brisk purgative frequently promotes a free and abundant secretion from the kidneys, both when these are healthy and when they are diseased; and here we have, possibly, an additional explanation of the good offices of these remedies in Bright's disease.

One or other of the members of this group—most frequently sulphate of magnesia, or phosphate of soda—is often given as an evacuant of the intestines to persons suffering from fever, and they are reputed to be febrifuge. Their action in this respect is simply due to their unloading the bowels, by which much relief is obtained, and the fever is lessened; for it is well known that, in fevers, constipation augments the preternatural heat of the body.

Dr. Armstrong strongly recommended purgatives to be freely administered to fever patients during the first few days of their illness, and before exhaustion had set in. He advised their employment to produce several evacuations in the day. This treatment

in the present day finds—the author thinks justly so—favour with many practical authorities, although disapproved of by Dr. Graves. It is considered by some that, by free purgation in scarlet fever, the severe sore throat and the swelling of the glands, can be prevented, with many other of the disagreeable sequels of this disease, as the discharge from the nose and ears. With measles the bowels are very generally highly irritable, and diarrhœa is often present, on which account purgatives must be given with caution in this disease.

The salts of this group which find the most frequent employment are the bitartrate of potash, sulphate of magnesia, and phosphate of soda. This last is often useful, as it possesses but little taste, and so can be given to children in a little broth without their knowledge.

The sulphates in this group are frequent ingredients in the purgative natural waters, and thus are frequently used in small doses by persons who suffer from constipation, or from torpid liver. If the constipation is obstinate and unyielding, a draught of these waters should be taken once or twice in the day, as small doses of these remedies, often repeated, act with much greater certainty than if one large one is given. And hence it is a good practice, when the bowels are tightly locked up, and have resisted the action of a full dose of Epsom salts, to give the same remedy in small and often-repeated quantities.

It must be mentioned that sulphate of potash, although usually a safe and mild purgative, has, in some cases, proved poisonous, and so its administration must be conducted with some caution.

On account of the low diffusion power of these salts, very little passes into the blood, and the greater part, especially where they purge emerges from the system with the fæces, and their history is then completed in what has gone before. Small doses, if they tarry long in the intestines, ultimately pass into the blood, and are separated by the kidneys. They are reputed to act as diuretics.

The tartrates of this group are highly esteemed by many as excellent diuretics in Bright's disease, and are often employed

in such doses as shall be short of purging. The tartrates and bitartrates are converted in part in the intestines, and the rest in the blood into carbonates, and then lessen the acidity, or even produce alkalinity of the urine.

The action of these salts on the constituents of the urine has not yet been worked out, either in health or disease, except in the case of phosphate of soda.

As the action of this salt and of phosphoric acid, appears to be nearly identical, we shall speak of both of them here. Our account of their action is taken from Dr. Parkes's work on the urine.

The effects of these substances are highly singular, if Böcker's experiments on his own person are to be accepted as conclusive. Thus he found that phosphoric acid always carried out with it potash, and that phosphate of soda changed its base, and took potash in its place.

These substances, therefore, greatly lessened the quantity of potash in the body, and the acid would greatly lessen the amount of alkali in the blood, but for the singular fact which Böcker observed, that while separating potash both phosphoric acid and phosphate of soda caused a retention of chloride of sodium in the blood, and to such a degree as actually to heighten the alkalinity of the body.

The effect of phosphate of soda is to lessen the urea in the urine, partly by the retarding effect it exercises on digestion, by which the supply of food to the system is hindered, and consequently the quantity of urea separated by the kidneys is lessened. But it appears the diminution is also, in part, due to lessened metamorphosis of tissue, as when given on an empty stomach, still the urea of the urine is diminished. Phosphoric acid does not lessen the urea; it does not either affect digestion.

For the further influences of these two medicines on the urine, we must refer our readers to Dr. Parkes's work.

NITRATE OF POTASH.
NITRATE OF SODA.

These salts possess a very high diffusion power, and are freely soluble in water. They lower the temperature of water to which they are added, and hence are called cooling salts. This effect is very considerably increased if sal ammoniac be mixed with the nitre, and such a combination, as a refrigerator, has been applied to the skin. It is, however, now very rarely used for such a purpose, and is to be especially avoided if the skin be broken, as solutions of the nitrate are very irritating to wounds. Ice is in every way a preferable refrigerator.

Mouth.—In the mouth, the crystals of the nitrate have a cooling, saline taste. The crystals are sometimes sucked in acute inflammation of the throat. Other remedies are to be very greatly preferred.

Stomach.—In the stomach, it is thought, these salts, while dissolving will absorb heat, and so be cooling to this part. Such, indeed, is probably the case, but sufficient quantity cannot with safety be employed to be of any service in this way. Ice or iced water is far more effectual.

In large doses the nitrates inflame the stomach, and when continued, even in moderate quantities, for some time, very considerably disorder digestion, and at the same time produce nausea and vomiting, and a coated tongue.

They are, consequently, medicines whose action must be carefully watched.

How the nitrates can excite inflammation of the skin or stomach is not yet explained, for if these tissues be soaked in solutions of these salts, there is produced in them no greater change than occurs from the action of simple water.

From their high diffusion power these salts speedily enter the circulation, and pass but a short way along the intestines, unless indeed very large quantities are taken. They do not, therefore, purge, and have little or no direct influence, as far as is at present known, on either the small or large intestines.

As regards the action of the nitrates on the blood, much conjecture has been hazarded. It is well known they can, in blood withdrawn from the body, both prevent the coagulation of the fibrin or dissolve it when coagulated. (Scherer, however, asserts they are unable to dissolve the fibrin of inflammatory blood). These facts have led to the supposition that the nitrates may possess the same influence over fibrin while in the circulation, and consequently are indicated when this substance is in excess, as in inflammations and acute rheumatism. There is no proof, however, that they possess any such power, nay, the proof lies in the opposite direction; for the nitrates possess very little influence over fibrin, unless employed in considerable quantities, and hence it cannot be expected the small quantity, which may be taken without harm, can, after its dilution with the fluids of the circulation, influence in any way the fibrin of the blood.

The answer to this question has not, however, been left to speculation, for it has been ascertained that blood withdrawn from the body, both before and after the administration of nitrate of potash, contains the same quantity of fibrin.

These salts are considered by many to be very highly useful in acute rheumatism.

It has been supposed they are able to protect the valves of the heart, and to restore them to their natural state when made incompetent by this disease.

This supposition is founded on a misapprehension of the morbid processes which lead to contraction and incompetency of the valves. It was thought this depended on a deposition of fibrin from the blood on the surface of the valves; when by its subsequent contraction these become shrunken and inefficient. This is certainly not the case, as in acute rheumatism, these changes in the valves are owing to lymph formed in their own substance. Occasionally, however, fibrin is deposited from the blood on thickened and roughened valves. Yet even this cannot, from what has been previously said, be either prevented or removed by these salts.

But while it must be admitted these salts cannot act in the

way just mentioned, it is considered by many high authorities they are able to shorten and make milder an attack of rheumatism. This opinion is, however, not universally held. Those who advocate the use of nitre, administer it in large doses very freely diluted in water. They give as much as half an ounce to an ounce of the salt in the course of the day. Under its influence, it is said, the urine is soon greatly increased, when at the same time the fever declines, and the pains abate. At present there are no observations sufficiently exact to definitively settle this question.

The same discrepancies of opinion prevail regarding the influence of the nitrates on acute inflammation, which, however, is of the less importance, as there are many remedies which are very efficient in such diseases.

When large doses are taken there occurs pain in the stomach, with vomiting and diarrhœa, great weakness, faintings, loss of consciousness, and death. The same symptoms in a minor degree are witnessed when more moderate quantities are used. The person is made languid, and disinclined to exert either body or mind, and the pulse is feeble and slow.

These salts readily pass from the body through the kidneys with the urine, and in their passage over the urinary organs can irritate and inflame them, and may, after large doses, produce even bloody urine.

Nitrate of potash has been recommended for the incontinence of urine of children.

The nitrates appear to possess the power to increase temporarily the water and urea of the urine, but ultimately these both fall below their natural amount, and hence these salts are mere eliminators of these substances.

They enjoy with some a very high reputation as diuretics, and appear to be of considerable service in some cases.

CHLORATE OF POTASH.

This salt in many of its chemical properties corresponds to the preceding group of nitrates, and like them is possessed of a

high diffusion power, but differs from them in its sparing solubility.

Skin.—A solution of the chlorate has been used as a wash to foul ulcers, which it is said to clean and stimulate, but other remedies are to be preferred.

Internally.—This salt appears to possess the power to increase the saliva, and, according to Hutchinson and others, to produce ulceration of the mucous membrane of the mouth. It is largely used in various affections of the mouth, and has been found of most signal use in mercurial and simple salivation, in ulcerative stomatitis and aphthæ. By some persons, it is asserted its action is simply a local one, and all its good effects may be obtained in these diseases by its topical application.

Stomach.—On the stomach it seems to produce but little effect, unless very considerable quantities are taken, when, like the nitrates, it inflames the mucous membrane, and produces both vomiting and diarrhœa. It is not employed in diseases of the stomach.

Blood.—It passes with readiness into the blood, owing to its high diffusion power, but, from its insolubility, large quantities cannot be very quickly conveyed into this fluid.

It was at one time supposed, as this salt easily loses its oxygen, it might yield this up to the blood and tissues, and so promote oxidation, but careful observations have conclusively proved this view to be erroneous, as the salt can be re-obtained unaltered in the urine.

What influence, if any, it has on the organs of the body is unknown.

It has been recommended in facial neuralgia.

ALUM.
DRIED ALUM.
ACETATE OF ALUMINA.

These salts act mainly as astringents, in virtue, it is supposed, of their power to unite with albumen, and coagulate it.

On the entire skin they produce no effect, but when applied to sores they coagulate the albumen of the pus, mucus, or of the tissues themselves, and thus coat over the sore with an impermeable layer, and protect it from the action of the air. Alum may, like many other metals, be used to form this protective coating. These remedies have, however, a further action than that just described, for, as said above, they act as astringents by combining with the tissues, and condensing them. By this property, on the topical application of alum, the blood-vessels may be contracted, and the supply of blood to a sore much lessened. From this effect on the blood-vessels, and by condensing the tissues themselves, the members of this group can depress the vital actions of a sore, and so check from it the secretion of mucus or pus. Alum is for this purpose applied dry, or in solution to relaxed and abundantly secreting sores.

Other astringents in such cases generally succeed better.

Solutions of these substances may be applied to eczematous surfaces when these weep abundantly, to check this profuse discharge, and bring the eruption into a condition suited for other remedies. Alum, like other astringents, is not generally sufficient to heal the disease.

From their power to condense tissues and coagulate albumen, these substances may be used to control and check bleeding. Alum has the advantage of being almost always at hand, and can hence in a case of emergency be quickly resorted to. It is only the milder forms of bleeding for which it is used, and when the hæmorrhage is severe, or large vessels be open, other treatment is of course required.

But to check the bleeding of leech bites, or slight cuts, and from piles, alum dusted on the wound after it has been wiped dry, or applied in pretty strong solution, is generally sufficient. Bleeding from the gums may be treated in the same way. For the same purpose to check bleeding, it may be injected into the nose in epistaxis, or may be snuffed up as the dried powder. Bleeding from the uterus has been arrested by plugging its cavity with pledgets of lint soaked in solutions of alum.

As an astringent, alum in strong solutions (6 grains to the

ounce) may be applied to the prolapsed anus or uterus. It both assists their reduction, by reducing their size, and also their retention in their proper place. Alum, however, is not much used for either of these purposes.

As a wash in vulvitis of children, few remedies can be compared to alum. It should be used in the strength of 60 grains to a pint of water, and this must be frequently applied, by the help of a syringe, to the secreting surface, which, however, should first be washed free of pus with warm water. The lotion should be applied every hour or oftener, and a piece of lint soaked in it may be left between the parts. This, although very successful, not unfrequently fails to check this troublesome complaint, even when it cannot be traced to any irritation, as worms, constipation, or teething. The solution just named may be too strong, and both increase the inflammation and discharge; should this be the case, its strength must be reduced.

Similar solutions are useful in chronic otorrhœa to check the discharge and cure the disease, although in this complaint alum is far inferior to glycerine of tannic acid.

Simple and purulent ophthalmia of children, and especially the latter, may be very successfully treated by a solution of alum of the strength of 8 grains to the ounce of water. The conjunctiva must be well washed with this every quarter or half an hour. The frequency of the application is the chief condition of its success, for simple water, as frequently applied, is a useful, although inferior application.

There are few substances so useful as alum in certain diseases of the mouth. Thus in simple ulcerative stomatitis,—that form which begins at the edge of the gums close to the teeth, and never spreads far from this part, and is often limited, or most marked over one half of the jaw,—dried alum applied by the finger many times a day is amply sufficient of itself to heal the ulceration in a few days. This preparation of alum is to be preferred, and must be applied dry. It is not merely astringent, but from its attraction for water (which it has lost by being heated), it is also slightly escharotic, and so gently stimulates the indolent tissues of the sore.

Such ulcers affect, by mere contact, the neighbouring mucous membrane of the tongue or cheek and produce ulceration, and this may be equally well treated with dried alum.

The ulcers of aphthæ, if they show but little disposition to heal, or on the contrary extend, may be touched a few times a day with the same preparation, after which they speedily heal. Usually no such application is required, and chlorate of potash, and perhaps a purgative is all that is required. Other forms of ulceration may be treated in the same way. To the throat either dry or in solution, alum is recommended to be applied, in simple or scarlatinal sore throat, in tonsillitis, and even diphtheria. Perhaps from its present little use in any of these diseases, its good effects on them were exaggerated by its advocates.

Solutions of alum, as gargles, are of more use in the chronic inflammations of the throat, when the mucous membrane is relaxed and covered with a grey mucus, or with pus. In such conditions, alum is highly useful, although the glycerine of tannin will in general be found a surer and more agreeable application.

In chronic ozæna solutions of alum (a drachm to the pint) are highly serviceable, and many cases speedily yield when treated in the manner now to be described.

A basin containing the solution is placed about a foot above the patient's head, and in this one end of an elastic tube is placed. The solution is then sucked into the tube, when the other end is placed in one nostril, and the ala of the nose pressed on it, but without closing it. The fluid then runs from the vessel through the tube, which is converted into a syphon, up one nostril and down the other, washing most thoroughly all the parts of the nose. The head is bent a little forward, and the mouth must be kept open. If properly conducted, none of the solution escapes by the mouth, but the whole of it runs through the nose.

Such an application generally very speedily removes the disease, and when less successful checks the discharge, and removes the highly offensive smell from it if this—as it often is—be present. Acetate of alumina, by some, is preferred to simple alum, as more efficient in correcting the fetor of the discharge. The

application should be used twice a day, or oftener, if the fetor be not removed.

Stomach.—In the stomach, alum behaves as on the skin—it coagulates the albumen, and constringes the mucous membrane. By both of these processes it hinders digestion. As an astringent it may be used in bleeding from the stomach, which it often checks. It is, however, inferior to other astringents in such a disease. It sometimes controls vomiting, of what character is not with certainty known.

Intestines.—In the intestines alum acts in a similar way, and thus checks secretion from the mucous membrane, and so makes the contents of the canal drier and more difficult of propulsion, hence it constipates.

In virtue of this property alum is sometimes used in both acute and chronic diarrhœa. It has been useful in the diarrhœa of typhoid fever and of dysentery.

It is uncertain how far the members of this group can pass down the intestinal canal without being decomposed and rendered inert; probably not far. Alum has been very highly praised by the highest authorities for its good effects in lead colic. It is said to remove the spasm, and so the pain, and at the same time to unload the bowels. It is stated to accomplish all this with more speed and certainty than other remedies. It is ordered to be given in considerable quantities, as much as ten grains every hour. The few trials the author has given this treatment have not been rewarded with success.

If long continued, these substances produce loss of appetite, constipation, and at last chronic catarrh of the stomach and intestines. Large doses at once cause gastro-enteritis, with its usual symptoms.

In certain stages of whooping-cough alum is an excellent remedy. It is useful when the acute stage is over, and when there is present no fever nor inflammation of the lungs, or any irritation of the teeth. In fact, it is only useful in uncomplicated cases. Used under these circumstances, there are few remedies which give more satisfactory results. (See Lobelia Inflata.) The violence and frequency of the paroxysms are speedily

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reduced; indeed, often the frequency is at once lessened to a half, and the case is quickly conducted to a satisfactory end.

The troublesome vomiting so often met with in this disease is in many instances at once checked by the alum, while, at the same time, the appetite much improves—effects which are observed even before the cough is in any way controlled. It rarely happens when the medicine is administered in this disease for constipation to occur.

It is possible the alum influences whooping-cough by its astringent action on the throat. To support this conjecture, the following considerations may be urged:—Other astringent substances, such as tannin, &c., are useful in the disease—(see Tannin)—and this occurs when the remedy is only applied to the throat, as when glycerine of tannin is so employed. Again, alum acts best when mixed with some tenacious fluid, as gum, glycerine, or honey, by which the solution is made to hang about the fauces for some time.

The alum should be given in doses varying from two to six grains every three hours, or the medicine, in corresponding doses, may be given every hour. The paroxysmal cough, which may continue a long time after whooping-cough, and other coughs having the same character, may be well treated by alum.

How much of these substances is absorbed by the intestines, and conveyed into the blood, is unknown; but probably not a very large quantity.

The chief part of these substances escapes from the body with the fæces, which are said to be made firmer, and to lose their smell.

Alum is recommended and employed as a remote astringent to check bleeding from the lungs, uterus, kidneys, &c., and also to check profuse discharges and great sweating. It is doubtful if alum has much power in this respect. Solutions of alum are very useful as injections to check the discharge of leucorrhœa. They must be employed in the manner directed for the injection of carbonate of soda. (See Potash Group.) The alum solution constringes the parts very much, and sometimes

cause severe cramp-like pains in the belly. Such injections rarely fail, if properly applied, to check the discharge.

Half an ounce to an ounce of alum dissolved in a pint of water may be used. Should a solution of this strength cause pain, a weaker one may be substituted.

PREPARATIONS OF IRON.

Iron is a constant and necessary constituent of the body, and must be regarded as an important food.

None of the preparations of this metal produce effects when applied to the entire skin. On raw surfaces, sores, and mucous membranes, several of the soluble salts combine with albumen, condense the tissues, and constringe the blood-vessels, and are thus astringents. At the same time, they act as stimulants, or irritants, according to the strength of the application or the condition of the sore.

The organic salts are the least astringent and stimulating, while of the inorganic, the ferric salts possess these properties in a greater degree than the ferrous salts.

Several of these compounds of iron may be employed on account of the properties just mentioned, but when a stimulant is required, other metallic preparations are to be preferred. As astringents to check hæmorrhage, the sulphate, but especially the ferric chloride, solid or in solution, is employed.

The last salt is a powerful styptic, and easily controls the bleeding from small vessels. It is possessed of one disadvantage as a styptic, for it irritates the surface of wounds, and prevents their union by first intention. When such union is desired, carbolic acid will probably supersede the perchloride of iron, for when properly employed, this in no way prevents the immediate closing of the wound.

Mouth.—In the mouth the soluble preparations have a metallic astringent taste, and act on its mucous membrane, as on the abraded skin.

Owing to the black sulphide which these salts form with the

sulphuretted hydrogen of the breath, they are never used in this cavity as astringents, lest the teeth should be discoloured black. For the same reason, it is advised to take them through a quill, glass-tube, or reed.

Salts of iron stain the tongue black.

In the stomach, the effects of these salts differ according to their properties. Some are astringent, stimulating, and in large doses irritating to the mucous membrane, as the pernitrate, the perchloride, the iodide, and the sulphate, while the remaining preparations are almost without action on this membrane. This difference in their effects regulates their application in medicine. If the stomach be a delicate one, or is already in an irritated state, then the mild, unirritating preparations are to be employed; but where the mucous membrane of the mouth and also of the stomach is relaxed and flabby, as it very generally is where iron is otherwise indicated, then the astringent preparations are preferable, as they brace up the mucous membrane and appear to promote digestion. Under such circumstances, the sulphate and tincture of the perchloride are excellent preparations. The soluble preparations of iron combine with the albumen which is present in the stomach, while the insoluble ones are in a variable amount dissolved in the acids of the gastric juice. The reduced iron is pretty freely soluble in this acid, but gives off hydrogen gas, or, if the preparation be an impure one, and contains a sulphide, sulphuretted hydrogen, either of which gases causes troublesome eructations, and the latter a very disagreeable taste. The peroxide, if strongly heated, is soluble with great difficulty in the stomach, and the more slightly heated forms should therefore be preferred. The carbonate and the magnetic oxide are more easily dissolved than the sesquioxide.

The metallic preparations and the proto-salts, after they are dissolved, become, either in the stomach or duodenum, converted into sesqui-salts, very possibly by means of the oxygen of the air mixed with the saliva, which is swallowed.

As the quantity of the acid of the gastric juice is small, only a very limited quantity of the iron-salts can be dissolved.

It is worse than useless, therefore, to administer the insoluble

forms of the metal in very large quantities, as they must remain undissolved, and load and obstruct the bowels.

In bleeding from the stomach, the astringent preparations, as the perchloride, acetate, pernitrate, or sulphate may be employed to check the hæmorrhage.

In the intestines, these preparations, in proportion to their astringency, confine the bowels.

This they must accomplish by their influence on the upper part of the small intestines, as, in a short time after they leave the stomach, they are changed into an insoluble and inert sulphide.

The sulphate, acetate, perchloride, pernitrate may, in common with other astringent metallic preparations, be used in diarrhœa. The pernitrate has been much praised for its influence over the chronic forms of this complaint, and is probably for this purpose an efficient preparation.

Owing to the astringency of iron salts, and as they are taken in many instances for a considerable time, it is a useful practice to combine the preparation with a small quantity of some mild purgative as a few grains to half a drachm of sulphate of magnesia, soda, or potash. By many persons, it is considered the purgative very considerably aids the absorption of the iron.

The iron-salts, as we have said, in their course along the intestines, are changed into a sulphide of the metal, which gives to the fæces a black and characteristic appearance.

A very small quantity of an iron-salt is sufficient to stain very deeply the motions and to keep them much blackened for several days after the medicine is discontinued. Iron-salts have no direct influence on the pancreatic or biliary secretions.

In the treatment of the small thread-worms, whose habitat is the rectum, the tincture of the sesquichloride of iron may be usefully employed as an injection, in the strength of half a drachm of the tincture to a pint of water. The iron coagulates the albumen of these animals, and so destroys them.

An interesting and important question is, how much iron is absorbed and enters the blood? Of the insoluble compounds, probably, but little, as the quantity of acid in the stomach is not great. Of the soluble preparation, it is difficult to give an

answer to this question. It has been considered, as the increase of the iron in the urine, after the administration of a soluble iron salt, is very small, therefore very little passes into the blood. This view was considered to be strengthened, by the fact, that almost all the iron taken by the mouth may be re-obtained from the fæces, and it has been said none so recovered can have entered the blood.

From these circumstances, it has been concluded, very little iron can be absorbed.

An increase in our knowledge concerning the elimination of metals from the body has shown this reasoning to be inconclusive, as probably most metals, and certainly iron, are eliminated from the system through the intestines, and find their way from the body with the fæces. For when iron salts are injected into blood, almost the whole can be recovered from the fæces.

That much more iron is absorbed than is appropriated by the blood corpuscles, is shown by the decoloration it produces in all the albuminous secretions of the body, for the fluids, bathing the various cavities of the body become coloured reddish-brown.

Apropos of the quantity of the metal absorbed, it may be here mentioned, that while many medical men advocate the use of large doses of iron salts, others as strenuously maintain all the good effects may be obtained from very small ones, and they instance the good results which often follow the use of ferruginous water. There is truth in both opinions. If the iron is required merely to afford food for the blood corpuscles, small quantities in a finely divided and much diluted state are sufficient. But the iron salts have other important properties besides their influence over the growth of the corpuscles, they can act beneficially on the mucous membrane of the digestive canal when this is relaxed, and probably in this way promote the functions of this part. It is, moreover, highly probable, the iron has, after its entrance into the blood, a further influence than merely to increase the quantity of red corpuscles.

Thus iron preparations are not employed simply to assist the formation of the blood discs, but also on account of their influence on the tissues of the body.

Where we desire to affect beneficially the mucous membrane of the digestive canal and the tissues, large quantities of the soluble astringent preparations should be administered.

The experience of physicians of the last generation was in accordance with these views, and so also is that of many highly practical men of the present day. But on the introduction of the bland and almost tasteless preparations, these were thought to be in every way superior to the astringent forms.

The fact of their tastelessness is certainly much in their favour, and then, mainly on speculative grounds, it was considered the astringent preparations must disorder digestion in those persons who are anæmic, and whose tissues are flabby, and in whom digestion is weak. With many persons these theoretical opinions still prevail, but the author believes them to be wrong, and that, in the class of patients described above, the astringent preparations are to be preferred, and even in large doses, and that much of the good observed to follow on their administration is to be accounted for by their direct action on the mucous membrane of the stomach and intestines. It has been experimentally shown that sulphate of iron does not check the solvent action of the gastric juice, and by experience we may probably conclude, that in the weak anæmic people, of whom we are now speaking, it does not lessen, but increases the formation of this secretion.

As has been mentioned, if the digestive mucous membrane is in an irritable state, then the astringent iron preparations, if in any quantity, may do harm.

There are also individual peculiarities in respect of iron, as some people have their digestive organs easily upset by it, while others in apparently similar conditions, can take it without inconvenience, and with great benefit.

If it be desirable to continue iron salts for a considerable time, then the organic and milder inorganic preparations should be employed. It is further advisable to change the preparation frequently, as by this means the stomach is less deranged, and the salts apparently better absorbed.

Influence on Blood and Tissues.—In the blood the iron, according to most authorities, combines with albumen. Bernard

thinks it is present as a protoxide. Iron under certain conditions increases the quantity of blood corpuscles, and so improves the nutrition of the body generally. By many it is held the astringent preparations, as the sulphate and perchloride are more efficient for this purpose, than those whose local action is milder.

Iron salts are thus useful "in maladies attended with defect of the red corpuscles of the blood; as in anæmia, with or without irregularity of the uterine functions (chlorosis, amenorrhœa, dysmenorrhœa, and menorrhagia), and whether occurring spontaneously and without any obvious cause, or resulting from profuse discharges (hemorrhages, fluxes, as leucorrhœa, &c.), from food defective in either quantity or quality, and from deficiency of light and pure air. In these cases, the use of iron, conjoined with sufficient nourishing food, pure air, abundance of light, and, when necessary, the employment of purgatives, proves curative. But, when the anæmia or hydræmia is dependent on organic diseases,—as cancer, granular degeneration of the kidney, or morbis cordis—the use of iron can at best be palliative only.

"Also in some chronic affections of the nervous system great benefit is obtained by the use of iron. Chorea in a large number of cases may be relieved, and oftentimes cured by chalybeates; though, in general, they are inferior to arsenic, which usually cures chorea much more speedily and certainly than they do. Cases, however, sometimes occur in which the chalybeates are preferable; as where anæmia co-exists. Epilepsy and hysteria are other nervous affections which are sometimes benefited by a course of iron, especially when they are attended with anæmia or uterine obstructions." (Pereira.)

In scrofula and rickets the long-continued use of iron proves highly beneficial.

In amenorrhœa iron-salts are commonly administered. Usually there is present with this affection much anæmia, and by removing this—at the same time improving the health—these remedies assist to restore to the uterine organs their proper functions.

In the employment of iron in most of the above affections, it

must always be remembered the anæmia is dependent not on any deficiency in the supply of iron, but on a scanty assimilation of it; and hence its use must be combined with well regulated hygienic circumstances of life, otherwise the iron appears to do very little good.

Salts of iron are recommended in some cases of neuralgia, where no organic or other cause can be discovered, and especially where anæmia is present. Their action is very uncertain. The huge doses in which these salts, and especially the sesquioxide, have been given are probably injurious, and have no greater influence over the disease than smaller ones. Large doses of perchloride of iron are of great benefit in diphtheria. It is a good plan to use the solution rather than the tincture, and to give the medicine very frequently—every hour, or even oftener. It is uncertain whether the effects on the throat depend on the topical action of the medicine, or are produced after its entrance into the blood. By some persons the solution is frequently painted on the throat, when it is necessary, however, to be very careful not to use any violence, as by increasing the inflammation more harm than good will follow the treatment. By this means the spread of the disease appears to be arrested, and it is said, the strength of the patient maintained. The solution may be applied with the atomizer, and then will reach into the trachea and bronchial tubes. The same treatment, namely, large doses of the perchloride, given every hour, has, by some persons, been found of great use in erysipelas. The frequent repetition of the medicine is one of the most necessary conditions of its success. In the hands of some observers, this treatment has altogether failed. It is possible the failure may be accounted for by the long intervals which elapsed between each administration of the medicine.

In the so-called hysteria of middle-aged women, and which happens especially at the time the menses cease, there often occurs much fluttering of the heart, with a feeling of fulness of the head, with heat and weight on the vertex. There are also frequent flushings of the face, and "hot and cold perspirations." Such symptoms, when they occur together, may gene-

rally be removed, and the patient made much more comfortable by considerable doses of the sesquichloride of iron, given three times a day. If the symptoms are limited to the head and face, and there is no fluttering at the heart, then other remedies are more successful (nux vomica, opium, belladonna). But where this last-named symptom is added, in the author's opinion, the sesquichloride will be found of especial use.

The salts of iron sometimes excite considerable irritation of the bladder, with frequent desire to pass water, which may contain a considerable quantity of mucus. With children it may cause nocturnal incontinence of urine. Iron-salts not unfrequently remove from children the same troublesome complaint, even when it is not dependent on worms in the rectum, or other irritation. The astringent preparations of iron can lessen or arrest hæmorrhages, as from the lungs and kidneys, the acetate is the best preparation for this purpose. The following is a very effectual way to administer it:—Add sufficient of the salt to water to make it taste distinctly, but not disagreeably, and let the patient sip this constantly. By this means sufficient quantity of the medicine can be taken without exciting any nausea or disgust; indeed, patients often like it.

The salts of iron appear to lessen profuse secretions as occur in chronic bronchitis, and also leucorrhœa. Dr. Graves gave the compound iron mixture to check excessive bronchial secretion, in doses of one or two fluid drachms.

The iodide of iron may be used where both remedies are indicated, as, for instance, in syphilis complicated with much anæmia. It is a question of much interest whether it is preferable to administer the two agents combined, as the iodide of iron, or separately, and whether they continue combined in their course through the stomach and circulation, or whether the salt is decomposed. Viewing this question, with our knowledge of chemistry, outside the body, we must conclude that in the stomach or blood an iodide of sodium and albuminate of iron are formed. But there are some observations, I believe, made by Bernard, which throw much doubt on this conclusion, as it was found if iodide of potassium and a salt of iron were injected into

the blood, no iron appeared in the saliva; but if an iodide of iron was employed in the injection, then both iodine and iron were present in this secretion.

Separation of Iron from the Blood.—Probably the iron of the effete red corpuscles escapes with the bile, and when iron salts are swallowed, this fluid contains an excess of the metal. This is, therefore, one way in which iron may be separated from the body.

Its further separation is by means of those membranes whose secretion is albuminous, and as this metal, like most others, very probably, can only exist in the blood as an albuminate, it has been conjectured iron can only be separated by those secretions which contain albumen. The following facts and considerations favour these assertions.

When iron is injected into the blood, in a short time much of it re-appears on the surfaces of the body, whose secretion is albuminous; as the mucous membrane of the intestines, of the bronchial tubes, of the gall-bladder, and of the urinary bladder, and the serous membranes, as the pericardium, peritoneum, and pleura. A small quantity escapes with the urine, but whether this is excreted by the kidneys, or is separated by the mucous membrane lining the urinary passages, is uncertain. Some maintain the excretion is accomplished in the latter way, and urge, in support of this view, that when the iron of the urine is much increased there is always present irritation of the mucous membrane, shown by the frequent desire to make water, and by the excess of mucus the urine at such times contains.

The tincture of the perchloride of iron, in the proportion of half a drachm to half a pint of water, to which a drachm of laudanum is added, makes a capital injection for gonorrhœa or gleet. It often speedily checks the discharge, and very generally eases the pain on micturition.

A useful form in which to administer iron is as the syrup of the phosphate, if there be any indications for the employment of phosphoric acid. (See Phosphate of Lime.)

NITRATE OF BISMUTH.
CARBONATE OF BISMUTH.

Skin.—These powders are commonly used as cosmetics, and their use does no harm. They are useful as dusting powder to intertrigo and sometimes to eczema, but in the latter complaint there are other remedies to be preferred.

As both these substances are quite insoluble in any fluids they may meet with, when applied to the skin, they are unabsorbed and without influence on the internal organs.

Mouth.—In the mouth, from their insolubility, they are without taste, but sometimes occasion a disagreeable feeling of roughness, and may blacken the tongue. The rough taste of the medicine may generally be removed by administering it in milk.

Stomach.—At present scarcely anything is known of the changes these medicines produce in the stomach. Whether they are dissolved, and if the good which is often obtained by their employment depends on their physical or chemical properties, are questions which remain to be solved.

These preparations, and especially the nitrate, are very valuable in many diseases of the stomach. They ease the pain of most painful affections of this organ, whether it depends on slight or serious or so-called functional disease. Bismuth, therefore, finds frequent employment in cancer, chronic ulcer, and chronic inflammation of the stomach. It is especially useful in the chronic gastritis of drunkards. By subduing pain it checks vomiting, and so enables the stomach to tolerate and retain food till it is digested and absorbed. Hence bismuth may very considerably improve the general health. Many forms of vomiting of children, and notably those depending on acute or chronic catarrh of the stomach, are speedily subdued by this remedy. The various forms of pyrosis often yield to the same medicine, although the present limited knowledge, concerning the causes of this symptom, does not permit precise rules to be laid down concerning the kind of pyrosis over which bismuth can prevail.

Acidity of the stomach was successfully treated by Dr. Graves with nitrate of bismuth. He generally mixed it with opium or morphia, and sometimes magnesia. Subsequent experience has confirmed his recommendation. Flatulent dyspepsia, in some of its forms, yields more or less to bismuth. When given for this annoying complaint, it may be mixed with an equal quantity of vegetable charcoal.

Intestines.—These remedies are useful in some forms of chronic diarrhœa. Their action is most conspicuous when they are employed to check the exhausting purging of phthisis, and there is no doubt they will succeed when other remedies fail. In order to ensure their success, it is necessary to give them in very considerable quantity, as much as half a drachm to a drachm of the nitrate. This large quantity may be taken with milk, and does not disturb the stomach, while very often the most intractable diarrhœa subsides, and such an improvement in the general health is accomplished that patients, whose speedy death was expected, rally, and are enabled to perform the ordinary duties of life.

Neither preparation is employed for its action on the remote organs of the body.

Urethra.—An injection of bismuth, of the following composition—Bismuth, half an ounce; glycerine, an ounce; water, three ounces—is extremely useful in acute, and especially in chronic, gonorrhœa. The same injection sometimes proves serviceable in gleet.

Elimination.—The chief part, if not all the bismuth, finds its way from the body with the fæces. Some may be absorbed, but probably the quantity which enters the blood is extremely small.

LEAD SALTS.

Lead, when added to albuminous fluids, forms a precipitate composed of albuminate of lead, and so, like other metals, the soluble salts of this group, can, when applied to the abraded

skin or to sores, or to mucous membranes, coat them over with an impermeable covering, by which wounds are protected from the injurious influence of the air. If such an effect be required, other metals are generally employed. Besides combining with the albumen of the secretion, if there be sufficient of the solution, a similar combination with the tissues themselves occurs, which probably explains the power of salts of lead to condense these structures, and to constringe the blood-vessels, and so to act as astringents.

On account of their astringency, the soluble salts of lead are used as lotions to unhealthy and over-secreting sores, and to eczematous eruptions when these weep. Its power to check the secretion of the last-named disease can, perhaps, be explained by the slight alkaline reaction of some of the salts of lead which are used as lotions. But while lead salts have many properties in common with those of other metals, they differ from most in their unirritating and soothing character, and hence they are constantly used when an astringent and soothing application is desired. On account of their astringency, the soluble lead preparation may be used to check bleeding from small vessels; but other astringents are more effective.

Solutions of the acetate and diacetate may be employed as injections and washes in chronic otorrhœa and vulvitis of children. By their astringency they lessen the production of pus, and from their soothing qualities, they ease pain, if it be present, on account of which property they are of most use in the early periods of these complaints, when the acute stage has subsided, but the tissues are still irritable and painful. In the later stages stronger astringents are to be preferred.

Plasters, made of lead, are of frequent use on account of their bland, unirritating character.

An objection to them, and lead applications generally, is the black discoloration they produce from the formation of the black sulphide with the sulphuretted hydrogen gas produced by the decomposition of the discharges.

In ulceration and sloughing of the cornea, lead washes must be avoided, or a white compound is deposited in the structures

of the ulcer, and a permanent opacity is left when the wound heals.

Lead injections have been employed in gonorrhœa, gleet, and leucorrhœa.

Lead may be absorbed by the skin in sufficient quantity to produce lead poisoning. The form in which it enters the blood is unknown, probably as an albuminate, which is soluble in weak acids and alkalies. Such an undesirable result only occurs when the solutions are applied to large raw surfaces, and have been long continued.

This occurrence is so rare as not to prohibit in any way the use of lead lotions.

Mouth.—In the mouth, the insoluble salts are without taste, while those that are soluble, have a sweetish acid, and astringent one.

The soluble preparations are astringent to the mucous membrane of this cavity, and at the same time combine with the albuminous substances they meet.

As astringents, the solutions of acetate and subacetate have been used in salivation, but, from the fear of their absorption, and as they are not superior to more harmless astringents, they are now seldom used.

Stomach.—In the stomach, that part of the soluble compounds which has escaped combination with albumen in the mouth, is in this cavity converted into an albuminate.

As astringents, the soluble lead preparations are sometimes used in hæmatemesis, and have been much praised for their power to check pyrosis.

In the intestines, the albuminate of lead which does not pass into the blood is probably speedily decomposed, and a sulphide of lead produced, a compound from its great insolubility, without any influence on the mucous membrane of this canal. Still the soluble salts are powerful as astringents of the intestines, and cause constipation. They have also great power over many forms of diarrhœa, even that dependent on disease of the lower part of the small or of the large intestine.

Its effects on the parts of the intestines distant from the

stomach and duodenum, must be through the nervous system, and we know the closest sympathy exists between different parts of this canal.

In summer diarrhœa, a few grains of the acetate with a small dose of morphia is a sure and speedy remedy.

It has been recommended in cholera, especially in its early stages. In the purging from tubercular disease of the intestines of dysentery and typhoid fever, few remedies are so useful. The acetate should then be combined with opium.

It may be added to the starch injections, which are employed to check the different forms of diarrhœa, and will increase the efficacy of the application. As a suppository, it may be employed for a similar purpose.

In large doses, the acetate acts as a weak, irritant poison, but the symptoms it produces differ from other irritants chiefly by the absence of diarrhœa and by the presence of constipation.

It is by no means common to meet with cases of acute poisoning with lead-salts, and even the most soluble salts rarely cause death.

In the acute poisoning by the acetate, the following symptoms are observed:—Dry burning sensation in the throat, thirst, vomiting. Colic (pain relieved by firm pressure). Tenderness of the abdomen, obstinate constipation. Motions of a dark slate colour from the presence of plumbic sulphide. Great prostration of strength. Cramps of the extremities. Cold sweats. Giddiness. Numbness, and even paralysis of the lower limbs. Sometimes coma. The urine is scanty, and high coloured. In one case it is reported, in less than five hours the extensor muscles of the extremities became paralysed, and the flexors rigidly contracted. The subacetate is even more powerful than the acetate. The carbonate has no irritant action.

The treatment of acute poisoning is to promote vomiting by lukewarm drinks, to give sulphate of soda, or sulphate of magnesia, or fresh precipitated sulphide of iron; but this last is rarely at hand. The stomach-pump should be used, and milk, with white of egg, may be given with advantage.

If small, nay, even minute quantities, be taken for a long time, chronic lead poisoning is produced. There are very many ways in which this may occur, on account of the various employment of lead compounds. Oxide of lead has been used to sweeten wines, the soluble salts are used as hair-dyes, and wafers are often coloured with red lead. The carbonate is the basis of all paints, and in the preparation of paints, when the lead is ground down, unless great care is taken, the fine particles are suspended in the air, and inhaled into the lungs. Snuff was formerly adulterated with lead, and sufficient might in this way be taken into the system to produce chronic poisoning. Then, painters, if they eat their meals with unwashed hands, may, in time, introduce sufficient lead into the system to poison them.

Again, it occasionally happens that drinking-water becomes contaminated with lead dissolved from the lining of the tanks in which it is contained. Certain conditions of the water hinder its solution of the lead. Thus, pure water, and waters which contain carbonic acid, carbonate of lime, and sulphate of lime, act but little on lead.

On the other hand, waters which act most on this metal are those containing much oxygen, organic matters, nitrites, nitrates, and chlorides.

Carbonic acid is very protective of lead; it crusts the metal with an insoluble covering of carbonate, and protects it from the further action of the water.

The quantity of lead sufficient to produce all or some of the symptoms to be immediately named is very small; one-fortieth to one-fiftieth of a grain per gallon has proved sufficient. But there appears to be individual differences in respect to the action of lead, as some persons are sooner affected by it than others. This difference in people can, in some cases, be explained, as will be mentioned shortly. It is right here to say, acetate of lead, in five grain doses, may be given for weeks, or even months, and yet not produce any of the symptoms of lead-poisoning. This has been abundantly proved at the Brompton Hospital, where the acetate is largely employed to check the diarrhœa of consumption, and yet it is extremely rare, even after the medi-

cine has been continued for months, to meet with any symptoms which can be attributed to the lead which has been employed.

The following is a short account of the symptoms which may be present in chronic lead-poisoning :—

There is constipation, and, it may be, impaired digestion; a sweetish taste is experienced in the mouth; and a blue line is soon observed at the edges of the gums. This is produced by the sulphuretted hydrogen developed from the tartar of the teeth penetrating the tissues of the gums, and uniting with the lead in the circulation and tissues, forms with it a black sulphide. Consequently, the blue line is most marked in persons of uncleanly habits, and who do not clean their teeth. It is also seen only at the edge of the gums, where they come in contact with the teeth. None is produced where these are absent, and it is first observed, and always most marked, in the gums in the neighbourhood of the incisor teeth.

This blue line is one of the earliest appearances of the effect of lead, and one of the slowest to disappear.

Besides the above symptoms, the nutrition is impaired, and the skin becomes very sallow, and, sooner or later, severe colic, with obstinate constipation, and sometimes vomiting, happens. Colic may occur without any premonitory signs. At the time it is present the abdominal walls are retracted, and very rigid. Its pain is mostly eased, but is sometimes aggravated, by firm pressure.

Frequent cramps—often severe—are experienced in the calves of the legs, and sometimes in the uterus, penis, and scrotum, and the patient may be much affected by pain about the joints, generally of the extremities, which simulate very closely those of rheumatism, and are increased by movement or wet weather.

Paralysis may be produced, most generally of the upper extremities, and affects the extensors of the arm, with its supernators and pronators. The muscles of the ball of the thumb also waste greatly, and in severer cases, the deltoid, and even the muscles of the neck and trunk, are similarly affected. Indeed, in the worst cases, there may occur general paralysis, with wasting

of the muscles of the whole body, so that the voice even may be made weak.

The paralysis mostly only affects motion, but sometimes sensation is also lost. Epilepsy, delirium, convulsions, or coma may occur, and destroy the patient; but deaths from chronic lead-poisoning are uncommon.

The cramps are not limited to the muscles of the extremities, but the intestines are also affected by them—it may be almost throughout their length, but more often for only a limited extent. The contraction can sometimes be felt in the lower part of the bowels, if the finger be passed up the rectum. The blood-vessels are said to be subject to cramps, like those of other parts of the body.

How the lead produces these paralyses and spasms, whether by attacking the muscles, nerves, or blood-vessels, is at present quite unknown.

It cannot be due to albuminate of lead being formed in the affected tissues, or other metals should produce similar phenomena. Against the idea of the nerves being the first affected in the lead paralysis, it may be stated paralysis does not precede wasting, but the wasting the paralysis.

The colic is generally dependant on constipation, which state of bowels is its immediate exciting cause, for when this is removed, very generally the colic also disappears.

The influence of lead on the urates in the blood is most singular. Dr. Garrod, in his remarkable discoveries concerning gout, has elucidated this subject, and shown how intimate is the connection between lead-poisoning and gout. In gout, as this philosophical observer has shown, there is retention of urates in the blood, with perhaps, also an increased formation of them. In this disease, especially during the acute attacks, there is scarcely any uric acid in the urine, while abundance can be discovered in the blood. The urates dissolved in the blood have an especial affinity for particular structures, as the cartilages and bursæ, and fibrous tissues, and particularly for those of certain parts. As the urates are being deposited in the joints, they excite acute inflammation, and this is gout.

Lead has the power to check the separation of urates from the blood by the kidneys, for when it is taken, the uric acid of the urine is lessened, whilst that of the blood is much increased, and thus the pathological condition which excites the gouty inflammation is produced. Dr. Garrod has further shown,—and the experience of all who have looked into this matter, confirms his statement,—the great frequency of gout in persons who work in lead, and how constantly in the out-patients' room of an hospital, when persons present themselves with gout, they also exhibit the blue line of lead on their gums.

It may be further added in confirmation of Dr. Garrod's discoveries, if, to gouty people who are free at the time from an acute attack, a salt of lead be administered, acute gout is developed, with its accompanying symptoms of severe pain and high fever. Dr. Garrod first pointed out this fact, and the author has repeatedly verified his assertion.

In the above remarks, we have an explanation, in part, at least, of the good effects on gout which have been observed to follow on the employment of iodide of potassium, as this salt, as has already been remarked, can aid the excretion of lead from the system.

Lead is used for a variety of purposes, but chiefly on account of its supposed astringent action on the tissues of the body. Thus it has been employed in profuse discharges of the mucous membrane, as from the lungs in bronchitis, in which disease it has been strongly recommended. It is also employed to check bleeding from the nose, lungs, kidneys, and uterus.

Lead, it has been conjectured, might check, in Bright's disease, the escape of albumen from the blood through the kidneys, and so lessen the amount of it in the urine.

George Lewald has published some experiments, which he conducted, in order to make our knowledge on this matter more certain. He does not mention the form of kidney disease his patients suffered from, but it was probably the pale, flabby, fatty kind. He at the same time observed the influence the lead had on the amount of urine voided.

These experiments, too few, perhaps, to decide altogether the

question, showed that by the employment of lead, the albumen of the urine was constantly diminished, but only to a very small amount, namely in the 24 hours to about 9 or 10 grains.

The diminution appeared to hold no relation to the quantity of lead administered.

At the same time, the quantity of water in his experiment was increased on an average by 200 c.c. in the 24 hours.

Here again it is necessary to say the increase held no proportion to the quantity of lead employed.

Lead has been found after it has been administered, in the lungs, kidneys, spleen, liver, and brain, but there is no proof at present of its possessing an especial affinity for these parts.

M. Paul has investigated the influence of lead-poisoning on the fœtus. He says persons who work in lead factories abort greatly, and that the father may cause this even when the mother is not so occupied.

In 123 pregnancies, 73 children were born dead. Of these 73, there were 64 abortions, and 4 premature births, and 5 born at the full time.

Of the 50 born alive,

20 died in the first year.
8 do. 2nd. do.
7 do. 3rd. do.
1 died later.

14 only reached the age of 10.

Of the elimination of lead very little is known. A little passes off with the urine, but the quantity is not large; it is, however, increased by the administration of iodide of potassium.

It is a further question whether the metal is separated by the kidneys with the urine, or is separated by the mucous membrane of the urinary tract. For theoretical reasons, it is difficult to see how metals, which exist in the body as albuminates, can be eliminated with a non-albuminous secretion; and when—as after the administration of iron and other metals—an increased quantity of the metal is detected in the urine, there is said to occur at the same time, an increased amount of mucus, and signs of irri-

tation of the mucous membrane of the bladder, from which circumstances it has been inferred the metal is really separated with the mucus secreted by the mucous membrane, and that the secretion of this, after the use of the metallic salts is much increased, and even a catarrhal condition of the parts produced.

CHESTER ROYAL INFIRMARY

NITRATE OF SILVER.
OXIDE OF SILVER.

If the soluble preparations are painted on the entire skin, this is first coloured an opaque white, which gradually changes to brown and black. If the application be a strong one, vesication even is produced; as a caustic, nitrate of silver is sometimes applied to warts and other excrescences, but other applications are more suitable, because more successful.

Applied to the abraded skin or to sores, the soluble salts of silver form albuminates, and cover the surface with a thin coating which can protect it from the irritation of the air. At the same time, the nitrate of silver acts as a powerful excitant of the tissues, and destroys them, but only very superficially, and for these properties it is very frequently employed to unhealthy and unclean ulcers, to induce in them healthier growth. The application is accompanied by much smarting pain, which, however, soon passes away.

Like most other soluble metallic preparations, the nitrate causes condensation of the tissues as well as contraction of the blood-vessels, and can, on account of these properties, be used to stay hæmorrhage. As, however, it is liable to excite much inflammation, besides producing much pain, other blander astringents should be first tried. It is sometimes necessary to resort to the nitrate of silver to check the bleeding from leech-bites.

It has been asserted, if a surface, burnt or scalded, be painted over with nitrate of silver before vesication has been produced, both the blistering and pain are prevented.

The pitting of small-pox may be prevented if each vesicle, as

soon as it has formed, be opened and nitrate of silver applied to the raw surface beneath. But this is a very painful proceeding, and one which entails endless labour, and hence other simpler and painless methods are always preferred.

That species of boil, which begins first as a papule and then maturates into a pustule, and after which the inflammation extends till a large dead core is produced, may, it is said, be arrested in its early pustular stage, and the further enlargement prevented by painting it over at its very commencement with a strong solution of nitrate of silver.

Of this method the author has had no experience, but of the influence of collodion, to be mentioned in another place, on similar boils, he can speak with the greatest praise.

Herpes labialis and the vesication of shingles can be arrested if the patch of erythema be painted over with nitrate of silver before or as soon as the vesicles begin to form. Solutions of caustic will also be found of very great use when painted over patches of lichen, to remove the troublesome itching of this complaint.

It is not uncommon for patients to have a patch of this disease of the size of the palm of the hand, which may be situated at almost any part of the body. The irritation of this may be excessive and sufficient to break the sleep and injure the health. Such itching can generally be removed by painting the patch with the nitrous ether solution of silver, which should be applied every day, or second day, as the itching may require.

Limited patches of eczema may sometimes be treated with benefit in the same way. The application in this disease is most serviceable when the weeping stage has passed.

The local application of nitrate of silver in erysipelas is very strongly recommended by Higginbottom. He says there is no agent so safe or efficacious in subduing external inflammations, but points out that the success of the treatment depends entirely on the manner in which it is conducted. He directs the skin to be well washed with soap and water, and then with simple water; after which it is to be wiped quite dry. Next, a solution of four scruples of nitrate of silver in four drachms of water, is to

be applied two or three times to the inflamed surface, and for two or three inches beyond.

He advises the employment of the brittle stick of nitrate of silver.

When nitrate of silver is used in solution as an outward application, it is far better to dissolve it in nitrous ether, as such a solution forms a uniform layer over the surface, and does not, like one composed of water, run into drops, leaving the intermediate skin quite dry. This superiority of the nitrous ether solution is owing to its power to dissolve the fatty matters of the skin.

Such a solution cannot be used for erysipelas in the way just described, as this nitrous ether will not dissolve the quantity of silver required. Solutions of nitrate of silver are used to blacken the hair of the head and whiskers. The hair is first washed with the solution of nitrate of silver, and then a comb, dipped into a solution of sulphide of potassium, is passed through it. This application produces a dull, shiningless black colour.

The solid stick of nitrate of silver is sometimes passed over the edges of the eyelids, when these are affected with obstinate tinea tarsi. The eyelashes should, with the scabs, be first removed.

Solutions of nitrate of silver, of various strengths, are employed in conjunctivitis. A few drops, with the aid of a quill, are poured into the eye several times a day. Like other irritants, it excites in the membrane a healthier inflammation, which quickly heals.

In the mouth the soluble salts have an astringent metallic taste. The nitrate may be applied to ulcers in this part, in order to change their nature, if this be an unhealthy one, and so to promote their healing.

In chronic sore throats, when the tissues are relaxed and covered with pus, solutions of the nitrate may be applied with benefit. The author, however, does not think their influence is in any way superior to that of the strong astringent and unirritating applications, which latter are, therefore, to be preferred, as the former causes much pain and has an extremely disagreeable

taste. Even ulcers, if not sloughing and very unhealthy, are best treated by the glycerine of tannin, but if they present the characters just mentioned, then the irritant nitrate of silver must be preferred. It is also employed as a local application in diphtheria, although with doubtful benefit. Most authorities are agreed the application should be limited to the inflamed patches, for if applied beyond them it excites a more extensive inflammation, on which the false membrane may readily form.

Nitrate of silver, in powder or solution, by means of a probang and sponge, is sometimes applied to the larynx when this is chronically inflamed, as in phthisis; or solutions of nitrate of silver, in the proportion of gr. $\frac{1}{2}$ to gr. v. to the ounce of water, may be brought to bear on the pharynx and larynx by the spray producer.

Stomach.—That part of the salt which has escaped conversion into an albuminate in the mouth is thus changed when it enters the stomach. If sufficient albumen is not present to accomplish this, the salt attacks the mucous membrane, and excites in it an active inflammation. If too large doses are taken, or if, as sometimes happens, in applying the solid stick of nitrate of silver to the throat, it breaks off and is swallowed, the best antidote which can be given is common salt.

In the stomach it acts as an irritant, and may be used in precisely the same class of cases in which it has been recommended to use arsenic. It often checks the pain and vomiting of chronic inflammation, of chronic ulcer, and even of cancer of this organ. When administered for such purposes, it should not be given in the form of a pill, but as a solution.

In the intestines the nitrate acts as an astringent, and may, in common with several other metallic preparations, be used in diarrhœa, both of the acute and chronic kind.

These salts enter the blood, and probably collect in the red corpuscles (as other metals tend to do), if not speedily deposited in the organs or separated by the secretions. After their absorption these salts are supposed to be astringent to the tissues to which they are conveyed, but it is doubtful if they possess this

property, and are never used to check either bleeding or secretion from the distant organs of the body.

Both the oxide and nitrate are employed in chorea and epilepsy, apparently with occasional benefit. The oxide has been given to check profuse sweating. If administered too long these substances, in some form, probably as the reduced metal, are deposited in the deeper parts of the skin. The deposition is most abundant where the skin is finest and most vascular. Once deposited the metal remains as a permanent discoloration, and produces in the skin a deep leaden hue, which neither time or applications can remove. Such discoloration does not occur till the medicine has been taken for some months. This metal appears to be chiefly eliminated by the intestines and bile, very little escapes by the urine.

The nitrate, in solutions of various strength, is used successfully as an injection in gonorrhœa.

Some persons advocate a very strong solution (gr. xx. to ʒ), and state that by this the disease may, in many instances, be at once cut short. Others prefer a much weaker solution of one or two grains to the ounce of water, and to repeat the injection several times a day.

The solid stick is sometimes applied to strictures of the urethra.

The author believes a solution of glycerine of tannin, one half the strength of the pharmacopœia preparation, will be found a better injection for both gonorrhœa and gleet than nitrate of silver.

MERCURY AND ITS PREPARATIONS.

The salts of mercury have very different physical as well as chemical properties; but as their effect on the system is much the same in every instance, probably all mercury compounds ultimately assume in the blood the same form.

The nitrates of the oxide and suboxide are escharotic; but much of this action is due to the free nitric acid of the salt.

They may be used to remove warts, condylomata, and other slight excrescences. The annoying itching of some skin affections may be completely allayed by mercurial applications. Solutions of bichloride, black wash, or mercurial ointment, may each prove useful, but it is necessary the application should be a strong one. Trousseau has recommended as highly useful a solution of about twelve grains of bichloride in a pint of very warm water, and to bathe the part with this. The author has had much experience of these applications, and believes an ointment of calomel, composed of a drachm of the salt to an ounce of lard, will be found by far the best of them.

But this, with the other mercurial applications, is not useful in all kinds of itching of the skin, as the irritation of urticaria remains unaffected by it. (Benzoic acid.)

Mercurial ointment will almost immediately remove the itching of pruritus ani. This irritation may be due to rashes, such as psoriasis, lichen, or eczema, or there may be no eruption to be seen, and yet the ointment will prove equally efficacious in all. Sometimes the itching is felt along the raphē leading from the anus to the scrotum, and may be due to little round spots looking like psoriasis, with the scales washed off. This form also yields to the ointment. Pruritus pudendi is also often similarly eased by this application.

The rashes themselves are in many instances improved by the ointment, but this, in some measure, is due to the cessation of the scratching on the disappearance of the itching.

There sometimes occurs in children a little scabbiness of the head, looking like mild eczema, but which is accompanied by such an amount of itching as to prevent sleep, and to cause constant restlessness. This irritation may be speedily appeased by the application of the mercurial ointment.

Pityriasis of the scalp is sometimes accompanied by a distressing itching, which may be allayed by inunction with the same application. It can be profitably added to other ointments, as oxide of mercury or of tar, which are used for the removal of the disease. It may be said that surely so strong an application of

mercury, and especially when applied to soft and absorbing parts, as the inner surface of the vulva, and the skin around the anus, must produce salivation. No doubt care should be exercised, and no more of the application employed than is needed. Yet the danger of salivation seems to be greater than it really is; for with a very large experience of the ointment, the author has never seen salivation produced by it.

If the ointment be properly applied, a very small piece is generally sufficient to allay at once the irritation, and to remove it altogether in a few days, although it is very apt, after a variable time, to return again.

Should such be the case, relief may be again obtained by a renewed employment of the ointment. The grateful effects of this application is often almost instantaneous; but it sometimes happens that a few days' employment of it is necessary before ease is obtained. The author insists on the value of this application in these troublesome diseases, as he has many times seen it succeed when other remedies have entirely failed.

The ointment of white precipitate, or of nitrate of mercury, are useful for destroying the lice which infest the head, and hair over the pubis. They destroy both animals and their nits. The same applications can with benefit be used to kill the body louse, but staphisagria ointment is a surer and also a safer application, as it may happen if the whole body is anointed with mercury ointment, enough of it to salivate is absorbed.

The irritant ointments of mercury are useful as applications in tinea ciliaris, an obstinate and disfiguring complaint. The eyelashes should be cut short, and the ointment, either of nitrate or oxide of mercury, be applied night and morning. The scabs should be picked off before the application is made. Should these stimulating applications fail to effect a cure, more powerful ones, such as nitrate of silver, or sulphate of copper, may be used instead. The latter of these two last named compounds should be preferred, on account of the lesser degree of pain it produces.

Bichloride of mercury lotion will remove from the skin the stain of chloasma.

It is taught, on high authority, that paronychnia may be much benefited by the application every hour, for ten minutes, of mercury ointment. Poultices should be applied at other times.

Baths of corrosive sublimate and chloride of ammonium, in the proportion of half an ounce of the former and one ounce of the latter to the bath, are sometimes useful in the treatment of obstinate syphilitic and non-syphilitic rashes which may have resisted other remedies.

Patches of obstinate psoriasis, especially of the hands, and of lichen, will yield sometimes to the effect of mercury ointments when other milder treatment fails. The calomel and nitrate of mercury ointment may be mixed, and to them tar ointment is sometimes added with very apparent benefit.

The mercurial preparations, but especially the black wash are very useful as local applications to some syphilitic sores. Thus mucous tubercles, and also those elevated indurations which are met with at the anus of children, and differ from mucous tubercles, in being of a much larger size, of irregular shape, often limited to one side, and very generally extending some way up the rectum, are best treated by the local application of black wash. The last eruption which may bleed and smart greatly each time a motion is passed, very often only slowly disappears under the influence of mercury administered by the mouth, and may continue to slightly increase for months, while, if kept constantly moist with black wash, the friends may be assured of its removal in ten days or a fortnight. Other syphilitic sores are well treated locally by black wash.

Cyanide of mercury in solution, in the proportion of 10 or 15 grains of the salt to an ounce of water, is also useful as a local application to syphilitic sores, such as those of the throat, tongue, anus, &c.

The pitting of small-pox was at one time prevented by the application to the face of mercurial ointment, or of mercurial plaster.

It is a question of great importance, whether the mercury itself plays any part in arresting the maturation of the pustules,

and whether other applications are not as good. Much has been advanced on both sides of this question, but the author thinks it has been shown that other safer remedies may he used, if not with equal benefit, yet with sufficiently good results, as to render it desirable to employ them in preference to the mercurial compounds. For it is necessary, if possible, to avoid the use of the last-named applications, as several instances of very severe salivation have followed their employment.

It is probable, if light and air be excluded, the eruption of small-pox cannot develop, and pitting is consequently prevented. The necessary exclusion of air and light can be perfectly accomplished by other applications, as collodion and india-rubber dissolved in chloroform. These should therefore be employed in preference to mercury compounds.

The different mercurial applications, but especially the mercurial and calomel ointments are sometimes rubbed into delicate parts of the skin, to obtain their absorption and their general influence on the system. This method of treating syphilis has the advantage of not disordering the digestive canal, but has also the disadvantage of uncleanliness.

Mouth.—None of the mercurial preparations are employed for their topical action in diseases of the mouth; syphilitic ulcers of the mouth or throat have been treated with mercurial in preference to other caustics, but the practice has not become a general one. The solution of cyanide of mercury is used by some. The influence of mercurial preparations on tonsillitis in certain conditions is most marked. Here probably its effects follow not on its local application, but on its absorption into the circulation. The following are the conditions in which it will be found serviceable. When in quinsy or scarlatina the tonsils are so enlarged as almost to meet, and when the difficulty in swallowing is nearly insuperable, and it may be there is even danger of suffocation, if at such a time a third of a grain of grey powder be taken every hour, in a few hours the swelling is much reduced, and the danger, discomfort, and distress much removed. The effects of the mercury in such cases is often

most signal. If an abscess has formed, this appears to be more quickly brought forward and evacuated by this treatment.

The same powder, and in the same dose, and frequency of administration is useful in mumps, and probably as in the last case it acts only after its absorption. The swelling and pain of this affection may be speedily removed by this treatment.

In the mouth the soluble preparations of mercury combine with the albuminous matters they meet, and any left uncombined attacks the mucous membrane, and excites in it acute inflammation if allowed to stay there long enough.

In the stomach they act in a similar manner.

There is a form of vomiting not unfrequent in very young children—it may be of only a few weeks old—which grey powder or calomel, but especially the former has the power in many instances to control. The chief and to a great extent characteristic feature of this vomiting, is the suddenness and quickness with which it occurs after food is taken. Immediately the milk is swallowed, it is forcibly expelled, curdled or uncurdled, and without any retching or effort apparently on the part of the child. In its escape the milk shoots out of both mouth and nose. Diarrhœa may be present, but there is more generally constipation. This often proves both obstinate and dangerous, as all the food swallowed is rejected, till the child, reduced almost to a skeleton, dies actually of starvation. At the post mortem it often happens, nothing is found to account for these untoward results, or the mucous membrane may be much softened, and be in consistency and look, like water arrow-root.

This vomiting which generally resists all other remedies, may in many instances be quickly stayed by one-third of a grain of grey powder, repeated every two or three hours. A twelfth of a grain of calomel every two hours also sometimes similarly succeeds.

In the intestines those preparations which can be dissolved act as purgatives, increasing the secretion from the mucous lining and the contractions of the muscular coat. All are, however, not employed as purgatives, and when such an effect is desired, our choice falls either on calomel or grey powder.

Either of these are useful preparations for children on account of tastelessness.

The influence of mercury salts on the pancreatic and biliary secretion is still an undecided question. Seeing its influence on the salivary glands when their employment is long continued, some persons have conceived it probable they exert a similar influence on the pancreas, a gland whose secretion and whose structure is very similar to that of the salivary glands.

Concerning their action on the secretion of bile, the most opposite statements have been made.

By experiment on animals, it appears in health the secretion of bile is much diminished by mercury compounds.

This statement has lately been fully corroborated by the careful experiments of Dr. Hughes Bennett. An account of these observations was read at the late meeting of the British Medical Association, 1868.

Yet the experience of generations speaks as strongly in support of the assertion that in some diseases the bile is increased by mercury. And it is easy to conceive in disease these compounds may set aside the condition hindering the formation of bile, and so act as cholagogues, while still in health their influence is to check this secretion.

In congestion of the liver, it is thought by many the mercurial compounds do good. Those forms of jaundice due to obstruction of the bile ducts, in any part of their course, are cases unfitted for the employment of these medicines.

There is a form of diarrhœa common in children which is admirably treated by small quantities of bichloride of mercury. A grain dissolved in half a pint of water, and of this a teaspoonful each hour, is the strength and mode of administration which will be found successful; or, what proves still better, is one-third of a grain of grey powder each hour or two hours. The circumstances which call for this medication are the following:—

Where the child passes three or four pale, clayey, pasty, stinking motions in the day. At the same time, the health is bad, as digestion is imperfect, and, perhaps, much flatulent distension troubles the child. In most cases, if the treatment recommended

is adopted, the stools assume their natural biliousness and frequency in one or two days, even when the complaint has been of some weeks' duration.

There is another serious form of diarrhœa, either acute or chronic, common in children, which may be most admirably treated by the bichloride of mercury solution above mentioned. These are the circumstances which guide us to its employment:—Very slimy stools, especially if mixed with blood and accompanied by pain and straining. The slimy character of the motion is the great indication for this medicine, which character will, with certainty, be removed by its exhibition. It sometimes happens the slime is very tenacious, and, being coloured with blood, is described by the mother as "lumps of flesh." This affection, as we have said, may be acute, or it may be chronic, and last for months. In either instance the relief and cure by the bichloride is remarkably speedy and certain.

The dysentery, acute or chronic, of adults can be relieved in a similar manner, if the stools are slimy and bloody.

All mercury compounds, with the exception of the sulphide, find admission into the blood, and are employed in a variety of diseases on account of their action on the distant organs.

Formerly, the employment of mercury for the cure of patients with syphilis, was universal, and it was administered in all forms and stages of the disease. The quantity given was also very great, and the constitutional effects, sought to be produced, very serious. Further experience showed this severe treatment was by no means necessary; nay, that the injury it did was greater than the good obtained from it. These views reached the highest development when it was asserted that mercury had no influence on syphilis in any of its forms; and when many of the serious circumstances met in this complaint, as disease of the bones, &c., were laid to the charge of the mercury, and even denied to be produced by the syphilis at any time.

There is much to countenance these views, for it is singular how similar are the phenomena produced by mercury to those which result from syphilis. But the author thinks it is fairly shown, that the serious secondary and tertiary symptoms which

are laid by some persons to the charge of mercury, can be produced by syphilis, as, undoubtedly, they can by mercury salts, and so it happens, if these salts be given in too large quantities, and for too long a time, or under improper circumstances, they can, undoubtedly, do very great harm.

A very influential school of the present day maintains that mercury has no power over syphilis, and that its administration can only do harm. There is, however, a larger and equally influential school, who are as firmly convinced of the usefulness of mercurial-salts when judiciously employed.

The following are the views generally held by those influential authorities who believe in the efficacy of mercury :—

That it is good in both primary and secondary syphilis.

That it is of use only in the treatment of the hard chancre, and does harm in the soft.

That by the use of mercury the hard chancre is more speedily cured, and the secondary symptoms less liable to appear, and when they occur, are milder in character.

That most forms of secondary syphilis yield quickly on the employment of mercury.

The congenital syphilis of children in most of its forms succumb with singular rapidity when mercury is given.

While what has just been said is probably correct, it is necessary to say, that syphilitic patients may very often be completely cured without any mercury, and by mere general treatment which improves the health ; and further, if the health be kept in good order, the secondary symptoms will very generally not break out, or, if they do, will be of a mild character. And also it must be stated, cases of syphilis occur which remain entirely uninfluenced by mercury, and can only be cured by a diligent attention to those hygienic circumstances which mend the general health.

In the treatment of some obstinate syphilitic rashes, the mercurial fumigations with steam often prove of great service, and succeed in curing the patient when other means have failed.

Those who most firmly believe in the efficacy of mercury in this disease, are unanimously agreed, that it is undesirable to

give it in sufficient quantities to produce salivation; that, indeed, it is most harmful to do so. But while such is the case, it appears those preparations which salivate quickest have the greatest power over the disease, and hence it is the metallic and mercurous preparations, as grey powder and calomel, are preferred to the mercuric, as corrosive sublimate.

Mercury salts also increase the secretion from the buccal mucous membrane, and, as we have seen from that of the intestines, and very probably of the mucous membranes generally. Mercury salts were formerly thought to possess the power to control inflammations, and were constantly given even to salivation in such diseases. Now, however, their use under such circumstances is generally discontinued.

Bichloride of mercury certainly appears to be of great use in iritis and inflammations of the deep-seated parts of the eye. It is probably of service in other inflammations, especially of the serous membranes, in which it appears to check the inflammation, and to promote the absorption of the effused products of the disease.

Typhoid fever, according to very high authorities, among whom may be mentioned Dr. Parkes, may be most beneficially influenced by small doses of calomel. It is necessary for the medicine to be exhibited at the commencement of the disease, and is thought by some to be useless if the ninth or tenth day has past. It is stated to lessen the height of the fever, to shorten its course, to make much milder the intestinal derangement, and to check the diarrhœa. It has been recommended by some to push the medicine till the gums are slightly touched, but such is not only unnecessary, but harmful, and should be carefully avoided.

There are some observations, in part, made by Dr. Harley, which show corrosive sublimate is a "heart poison." For the heart of animals, destroyed by corrosive sublimate, soon ceases to contract after death; and if the heart of a frog be suspended in a solution of this salt, it ceases much sooner to beat, than a heart suspended in pure water.

Mercury remains a long time in the body, and, it is stated,

may accumulate in places as the heads of bone in globules of the metal.

Mercury salts are eliminated to some extent by the urine, but chiefly by the mucous membrane of the intestines, and with the bile.

Before this article concludes, it must be mentioned that children are much less affected by mercury than adults. Disease also influences the operation of the medicine, for often in inflammation it can be well borne, while granular disease of the kidneys or scrofula render persons very amenable to its influence. Individuals sometimes exhibit great difference in their susceptibility to the medicine.

PREPARATIONS OF COPPER.

When applied to the entire skin, the soluble salts produce no visible effect. On sores they unite with the soluble albuminous substances, and form an insoluble albuminate, which coats the surface, and may, in an imperfect manner, take the place of the lost cuticle. The thin pellicle thus formed protects the delicate structures from the air, and the substances floating in it, and so promotes the healing of the wound. Also, like many other metals, these salts condense the structures they touch, and constringe the blood-vessels, by which means they lessen the supply of blood to the part, and may also arrest hæmorrhage when this occurs from the smaller vessels. At the same time they act as irritants to the delicate tissues, and produce slight inflammation with some smarting pain.

To arrest bleeding and as an irritant to indolent sores, the sulphate is most employed, either in stick or solution, or in the form of an ointment.

Indolent forms of impetigo will sometimes heal when treated with sulphate of copper, after they have resisted the more usual applications.

The solid sulphate may often, with conspicuous advantage, be rubbed along the edges of the eyelids, when these parts are

affected with tinea tarsi. The eyelashes should be closely cut off, and the scabs carefully removed, before the application is made. Indeed, in all cases where slight stimulation is required, this salt may be used. In its action on the tissues it is milder than nitrate of silver, and produces very much less pain.

In the mouth the soluble salts combine with the liquid albuminous substances of this cavity, and more or less completely precipitate them. If used in quantities more than sufficient to do this, the mucous membrane itself is attacked, and is affected in a manner altogether similar to the abraded skin. These salts possess a metallic, styptic taste. The sulphate may be applied with great advantage, in the solid form, to the tongue when this is affected with either specific or simple psoriasis, and also to other indolent sores of this part. In solution it may be painted over the edges of the gums in ulcerative stomatitis, after which the ulcerated surfaces will generally quickly heal. In this disease dried alum is, on the whole, to be preferred.

The white, curdy-looking coating of thrush may also be removed, and its renewal prevented, by painting the mucous membrane with a weak solution of this salt.

In the stomach the soluble salts behave in a similar manner as in the mouth, and if taken in large quantities act as powerful irritant poisons.

These salts are emetic, and sulphate of copper is not unfrequently used for this property. As an emetic the sulphate is speedy in its operation, and mostly effectual. It generally produces one copious evacuation. It does not purge, neither does it produce much nausea or prostration. It is supposed by some to possess an especial action on the larynx, and hence when this part is inflamed as in croup, and when it is desired to expel any obstructing substances from the glottis by the mechanical efforts of vomiting, sulphate of copper is often preferred. A good way to give this salt, when it is desired to produce vomiting, is to administer it in small and frequently repeated doses.

On the mucous membrane of the intestines, in moderate doses, these salts are astringent, and the sulphate, either by the mouth or as an injection into the rectum, is often effectual in

staying severe chronic or acute diarrhœa, whether it depends on serious organic disease or not.

If copper salts, in small quantities, be taken for a considerable time, a condition not unlike that produced by lead is said to occur. There has been noticed colic, with alternating constipation and diarrhœa, and it is even said paralysis of the upper extremities undistinguishable from that of lead.

Salts of copper find their way into the blood, where they probably exist as albuminates. They have been given in chorea and epilepsy.

Solutions of the sulphate are employed in gonorrhœa, gleet, and leucorrhœa.

Copper is eliminated both by the urine and fæces.

PREPARATIONS OF ZINC.

To the skin the members of this group are employed for a variety of purposes.

Their common action is that of astringents and irritants; but on account of the difference in their solubility, their affinity for water, and perhaps for the tissues, they do not all possess these properties in an equal degree.

Of all these substances the chloride and iodide, from their high diffusion power, and great affinity for water, are the most energetic. Yet even these remain almost inert on the skin, unless the cuticle is first removed, when they permeate the tissues, and destroy them for a considerable depth. The effects of the chloride are the following:—There is first a feeling of warmth, which increases greatly, and continues for seven or eight hours, by which time the tissues are destroyed, and in their stead is formed a white eschar, which separates in about a week to twelve days. One statement made above requires some modification, as Mr. Marshall, of University College, has, by his experiments and observations, shown the nitrate to penetrate deeper than the chloride, and hence to destroy the tissues for a greater depth. It possesses, according to the same authority,

the further advantage over the chloride in producing less pain. These three preparations, but especially the chloride, are employed to destroy nævi, warts, condylomata, the skin where it is affected with lupus, and the tissue around syphilitic ulcers.

The sulphate has a lower diffusion power, and hence its action is much more superficial. In common with the rest of the soluble salts of zinc, it forms, with albumen, an insoluble compound, and also on account of its astringency, condenses the tissues and contracts the blood-vessels. As a stimulant and astringent, it may be employed on ill-conditioned, free secreting sores or eruptions, when it lessens the secretion, and promotes healthier growth. It is also used in common with the chloride as an injection in gonorrhœa or gleet.

The following is a useful injection for gonorrhœa:—A grain of chloride of zinc is dissolved in a pint of water. Some of this is to be injected every hour of the day. Rest, if possible, should be observed; but this is not indispensable to the success of the injection. If the frequent injection causes any pain in the testicles, these parts should be suspended, and frequently fomented with hot water; but if, notwithstanding, the pain continues, and the swelling increases, the injection must be employed less often.

It may be objected so weak a solution as the one recommended is no better than simple water; to which it may be answered, simple water does not cure with anything like the rapidity of the above injection. And it may be further said, if some of this solution be taken into the mouth, and retained there a few seconds, it produces a decided roughness of the mucous membrane, and if the solution be strong enough to affect the mucous membrane of the mouth, it certainly can, in an equal degree, influence a similar structure in the urethra. By the above injection the disease may often be removed, if treated at its very beginning, in twenty-four to forty-eight hours.

The carbonate and oxide are insoluble, or but very little soluble, in the animal fluids; and as they possess no affinity for water, their action on the tissues is a very weak one.

They are, however, slightly astringent, and have been used

on account of this property as ointment, or in the form of powder. As ointment, the oxide is used as a mild stimulating application in eczema and impetigo, when, inflammation having subsided, the raw surface is left in an indolent state, and very little prone to heat. As dusting powder, both the oxide and carbonate are used, and, perhaps, are the best powders for this purpose; but as has been frequently observed, greasy applications are mostly to be preferred to such dry ones. A weak solution of the sulphate is frequently dropped into the eye several times a day when the conjunctiva is inflamed. In such cases it is very useful. The same salt is occasionally employed as a gargle in relaxed sore throat, and is sometimes added to alum injections for leucorrhœa.

In the mouth the more soluble preparations excite a metallic, styptic taste.

None of them are employed in diseases of the mouth. The chloride has been used to destroy the exposed, painful pulp of decayed teeth.

In the stomach the oxide of zinc leaves its acid and combines with albumen. At the same time, and, according to some authorities, in part on account of this change, they act as astringents. In large doses the carbonate produces some nausea and vomiting; but this result is much more decided after full doses of the sulphate, which is a speedy and safe emetic, and produces but little prostration or nausea, and generally only one complete evacuation of the stomach. On account of all these properties it is a most desirable emetic in cases of poisoning, and is to be preferred to ipecacuanha, whose action is slow and unsure. As an emetic it may be employed in bronchitis or croup; in the former to expel the mucus from the bronchial tubes, in the latter, the false membrane from the larynx. Other emetics are mostly preferred. It may be employed as an emetic, or in doses short of this, in painful affections of the stomach, dependent on chronic inflammation of the mucous membrane. No satisfactory explanation has yet been given of the action of zinc-salts as emetics. They possess this property even if mixed with albumen before they are administered.

The oxide has but little action on the stomach, on account of its insolubility, and but little of it is dissolved, unless it happens that, at the time of its administration, much acid is present in the stomach.

The chloride is a corrosive poison. The sulphate, on account of its astringency, may, like most other metallic salts, be employed in diarrhœa.

Its action must be exerted on the upper part of the canal, as what escapes absorption must be speedily converted into a sulphide, and so made inert. By habit, very large doses of the sulphate may be taken without either nausea or vomiting, or apparently any alteration in the mucous membrane of the digestive canal. Thus, as much as forty grains three times a day has been given for several weeks with no obvious bad results.

Such doses and such prolonged employment of the drug are undesirable, as it has been shown that, by its continued use, superficial ulceration of the stomach may be produced.

Zinc colic has been described. There was constipation, vomiting, prostration, with disagreeable taste in the mouth.

Zinc finds its way into the blood, and there probably exists as an albuminate.

The oxide and sulphate have been employed with advantage in epilepsy, chorea, and whooping-cough.

In epilepsy we now possess a better remedy in bromide of potassium. Chorea may also be controlled by these salts, although in most cases arsenic is to be preferred.

In certain forms of hysteria they prove useful, but especially in the shape of valerianate of zinc.

These substances are reputed to be antispasmodic. No doubt when they produce nausea they then act in this way, but it is doubtful if non-emetic doses are very efficient antispasmodics.

This metal does not become fixed in the body, or produce chronic affections as lead or mercury.

After injection into the blood the sulphate excites vomiting.

The oxide in two grain doses, given each night, is highly useful in profuse colliquative sweating. This it very often con-

trols. It is also said to check the profuse secretion from the bronchial mucous membrane in some forms of bronchitis.

It is eliminated from the body less rapidly than some other metals. It passes out of the system in small quantities only by the urine, and it has been thus asserted that very little of the oxide passes into the blood. This may be true, but the fact that the chief part of it may be re-obtained from the fæces is no proof of this assertion, as very possibly the metal, like many others, is excreted by the mucous membrane of the intestines, and with the bile.

HESTER
OYAL
RMARY

PREPARATIONS OF ANTIMONY.

In the form of ointment, tartar emetic excites in the skin a characteristic inflammation, which at first forms papules, then vesicles, and lastly pustules. The rash thus runs the course of the eruption of small-pox, and in each of its stages simulates this very closely. Yet there are points of difference which enable a practised eye to distinguish them. Like small-pox eruption, this rash often scars, and when it is added, the action of this ointment is capricious and painful, its undesirability as an external application is fully apparent.

This ointment has been used as a counter-irritant, for instance to the scalp in tubercular meningitis, when it is desired to obtain a powerful action of some continuance. Chloride of antimony is a powerful escharotic, and produces an ill-conditioned slow-healing sore.

Of all the members of this group, tartar emetic is most used, and to this preparation our remarks will apply, except when the contrary is stated.

None of these preparations are used as topical applications to the mouth. In the stomach, after small medicinal doses, there may occur a slight feeling of soreness, a sensation easily mistaken for hunger.

By its continuance the medicine produces increased secretion of mucus from the stomach and intestines, and hence the motions

are more numerous and moister, and there may occur diarrhœa with colic. Increased secretion of the bronchial mucous membrane is also noticed, and very possibly of the mucous membranes generally.

None of these remedies are used as purgatives, indeed such an effect is undesired, and to avoid it the tartar emetic is not uncommonly given in combination with opium.

Large doses excite nausea and vomiting. As an emetic, tartar emetic produces considerable depression with much nausea, and the vomiting is accompanied by great straining, and is repeated. It is somewhat tardy in its action, and may require twenty minutes to half an hour before it operates. This last named property disqualifies it as an emetic in cases of poisoning, where a speedy evacuation of the stomach is desired.

Like all medicines which nauseate, it produces weakness and prostration, but this it does in a greater degree than most other emetics.

Formerly tartar emetic was used for such a purpose to produce muscular weakness, and to relax spasm, and so to render easier the reductions of dislocations and hernia.

In such cases it is now completely superseded by chloroform.

The action of this medicine, Trousseau taught, was much influenced by food. He stated, with low diet it produces its constitutional effects, but with a full diet it excites vomiting and purging. Its action is further regulated by the quantity of water with which it is administered. If this be small vomiting is obtained, while if it be large diarrhœa is produced.

By Trousseau it was further observed that certain substances modify the effects of antimony, for wine and acid fruits, both fresh and preserved, develop the emetic and purgative properties of the medicine.

The soluble antimony compounds easily enter the blood, but the form they there assume is unknown. Possibly, either in the stomach, intestines, or blood, the oxide of the metal combines with albumen, and forms an albuminate. It has been stated antimony compounds possess no power to combine with albumen, except in an acid solution, when an insoluble compound is formed.

After the administration of tartar emetic, the insensible perspiration, chiefly of the skin, has been experimentally proved to be increased. As all emetics when they have excited nausea increase the sweat, it is difficult at present to decide whether tartar emetic has the power to increase the perspiration in any other way than by producing nausea. Tartar emetic, in the form of wine, is commonly given in fevers as a diaphoretic.

It is convenient here to notice the influence tartar emetic has on the excretion of carbonic acid and urea. Both these excrementitious substances are, under its influence, eliminated in greatly increased quantities. Whether the medicine is to be considered as a mere eliminator of these products, or whether it also increases their formation, the experiments recorded are not sufficient to determine, as in no instance were they continued sufficiently long to decide this question.

This remedy, in common with other emetics, is sometimes given in large doses to produce great nausea and vomiting, and by the strong impression then made on the system, it is held by many eminent authorities, among whom Dr. Graves may be mentioned, to be able to cut short acute specific fevers and inflammations, if employed at the very commencement of the attack. Graves held, that typhus might in this way be summarily checked. He states the period for the exhibition of emetics is very short, and after the lapse of 24 or 36 hours from the occurrence of the rigor, they will not succeed in arresting the fever.

Many cases of ague may be cured by the impression emetics make on the system, and in general, the action of quinine on the same disease may be aided by an emetic administered each morning, at least, cases which resist quinine often immediately yield to the united action of this medicine and emetics. Ipecacuanha and other emetics may be used for such a purpose.

As has been mentioned, it is a practice to give small doses of tartar emetic to fever patients. With such persons it is supposed to promote perspiration, and to act slightly on the bowels, but it is doubtful if it exercises any direct influence on the preternatural heat of fever.

In health it has no power to lower the temperature of the

body, if one experiment may be accepted as sufficient to settle this point. The author gave to a strong young man tartar emetic in half-grain doses every ten minutes, and continued this nearly seven hours. Great nausea and much vomiting, with profuse perspiration, occurred, but during the whole time the temperature remained most remarkably constant, not varying more than 0·4 Fahr., an amount of variation frequently observed in health.

This remedy has been much employed of late years in acute pneumonia, and the cases published to establish its claims, as well as the general experience of the profession, are strong in its favour. Discretion, however, must be used in adapting the dose to the strength of the patient, who, if weak, must take in conjunction with the tartar emetic, alcoholic stimulants. By its employment the pain in the side is removed, the expectoration from rusty is altered to bronchitic, the pulse and breathing are reduced in frequency, and the further spread of the inflammation checked. Such are the effects of the drug on many cases of pneumonia.

Other kinds of acute inflammation may be similarly treated, although the good results are not so apparent as is the case with pneumonia. It is necessary to give the tartar emetic at the very beginning of the disease, otherwise its power over it is trifling.

The dose, when this drug is employed in inflammation, is one-fourth to one-half grain every two or three hours, or a proportionate dose may be given every hour.

Treated in this way, tonsillitis, pleurisy, orchitis, bronchitis, puerperal peritonitis, and other inflammatory affections, may be shortened and made milder.

Concerning its action in health on the mucous membrane of the bronchial tubes, mention has been already made, and, as has been stated just above, it is useful in acute bronchitis. But it may also be employed with considerable success in chronic bronchitis, when the expectoration is copious, frothy, and difficult to expel.

In the following disease, tartar-emetic is invaluable.

Young children, six to twelve years old, on the slightest ex-

posure to cold, are attacked with much wheezing and some difficulty of breathing, which may be considerable, and compel them to sit, all night, propped up with pillows. The expectoration may be pretty abundant, but children of this age do not generally expectorate. On listening to the chest, there is heard much sonorous and sibilant, with perhaps a little bubbling, rhonchus; but this last is often absent. The child can be heard to wheeze for a considerable distance, and, it may be, the noise is so great as to be heard many rooms off.

Occasionally the cough is troublesome, and on each exposure to cold, the voice may become hoarse, and the cough hollow and barking.

Some children are thus afflicted whenever the weather is cold, even in summer, and may not be free the whole winter; with others, the attack lasts a few weeks only, or a few days.

This affection sometimes follows measles, and is compared by the mother to asthma, with which it is certainly allied, if not identical. Such children are speedily benefited by tartar emetic.

The following is the way to prepare and administer the solution of this salt :—Add a grain of it to half a pint of water, and of this give a teaspoonful every quarter of an hour for the first hour, and hourly afterwards. If the wheezing comes on at night, it is sufficient to give the medicine only at such a time in the way described.

The effects of the medicine are very speedily seen, for, often on the first night of its employment, the child is greatly benefited.

It may be thought so small a dose must be without effect, but very generally, when the medicine is first given, it is sufficient to produce vomiting once or twice in the day. If this occurs, the dose must be made still smaller, as it is not necessary, in order to obtain the effects on the lungs, to produce sickness.

There is, however, a disease somewhat similar to that above described, and which it is necessary to distinguish, as it remains unaffected by tartar emetic. It occurs in children a few months old, and consists of a loud rattling, which is obviously caused by mucus in the throat or larnyx. There is no bronchitis, or, if

this be present, it is a mere coincidence; nay, sometimes when bronchitis occurs this complaint ceases for a time. It is brought on and aggravated by cold, and may last, with some fluctuations, many months. In some cases, the rattling is worse in the day, but is usually so at night.

The wheezing of children and even adults, which follows an ordinary attack of bronchitis, may mostly be speedily removed by the same treatment. Very frequently, the tartar emetic is sufficient to allay the cough which may accompany the diseases just described.

On the heart this remedy acts as a depressant, and in health it weakens its contractions and increases their frequency. These results are in part dependent on the nausea it produces.

It may be usefully employed according to the recommendation of Graves, in certain conditions of fevers, as when there is much excitement and furious delirium, which may be very generally calmed by the exhibition of this drug. As there is very generally present much sleeplessness, which, indeed, is the cause of the excitement and delirium, opium should be added to the antimony.

Under the combined influence of these remedies, the excitement is calmed, and refreshing sleep obtained, out of which the patient wakes refreshed and free from delusions. When used in such conditions, these remedies may be the means of saving an almost hopeless life.

Each of these remedies appears to assist the action of the other.

The proportion in which they should be mixed must be determined by the circumstances of the case. If the delirium be furious, the tartar emetic must be in full, and the opium in small quantities. While if sleeplessness is the chief symptom, and the delirium be not very boisterous, the tartar emetic must be reduced, and the opium increased.

When employed for these purposes, Graves advises one-fourth to one-half of a grain of the salt every hour or two hours, and when it produces bilious stools, its administration must cease. This treatment is very useful in the delirium, which usually occurs about the 9th or 10th day of typhus fever.

The mania and sleeplessness of delirium tremens will very generally give way to the same treatment, which must be conducted on the rules laid down above.

Puerperal mania may be treated in the same way, although probably the bromide of potassium will give better results.

Tartar emetic is often of use in chorea, and is made to produce nausea and vomiting once or twice a day. The same remark applies to sulphate of zinc, and both these remedies must be given in increasing doses to accomplish this, as the system appears soon to tolerate them. As other remedies are superior to them in the treatment of this disease, they are first to be resorted to.

Tartar emetic may also be given with advantage in doses of $\frac{1}{36}$ to $\frac{1}{48}$ of a grain, three or four times a day, in strumous ophthalmia.

In acute poisoning by tartar emetic there occurs violent and continuous vomiting, accompanied with a diarrhœa of bilious and bloody stools. There are the common symptoms of gastroenteritis, and sometimes of peritonitis. The prostration is intense, and profound fainting is often repeated. The respirations and the pulse are said by some to be reduced in frequency as well as strength; by others it is asserted their frequency is increased.

The post-mortem appearances are, inflammation of the stomach and intestines, but not often of the gullet. The peritoneum may be, and, according to Harley, the rectum often is inflamed, and usually some inflammation of the lungs is also observed, which makes it probable that the tartar emetic has an especial action on these organs.

If the drug be applied to a sore or to the broken skin, or injected into the veins, it still excites nausea and vomiting. It must thus have an especial affinity for the stomach or nervous centres.

In the treatment of poisoning by tartar emetic, the vomiting should be promoted by warm demulcent drinks, while strong tea or coffee, tannin, or decoction of oak bark should be diligently administered.

Influence on the Urine.—The statements on this matter are

not consistent, but the following appears to be the probable effect of tartar emetic on this excretion. The water and chloride of sodium are lessened owing probably to increased perspiration. Urea is greatly increased, and apparently in accordance with the dose of the medicine. The pigment and uric acid are also increased, but to a smaller amount.

The golden sulphuret increases all the constituents of the urine, especially the urea, and sulphuric acid (Parkers on Urine).

Antimony is chiefly separated by the kidneys, but some with the bile, and perhaps by the intestines. A part is long retained in the body.

PREPARATIONS OF ARSENIC.

The difference in the action of the members of this group is, with the exception of arseniate of iron, one of degree. This preparation adds to the action of arsenic the medicinal properties of iron.

It is probable, therefore, that in the blood the salts of arsenic ultimately assume the same form.

Skin.—Dry arsenious acid produces no changes in the unbroken skin, but in wounds or sores it excites very active inflammation, sufficient, if the application be a strong one, to destroy the tissues for some depth. Arsenious acid has long been used on account of this property to destroy warts, condylomata, cancerous growths, &c.

It may be applied pure, or be mixed with some bland powder as starch, in variable quantities. At times the application has enjoyed a high reputation, whilst at other times it has fallen into almost complete disuse. It is said some persons have fallen victims to this treatment, for the arsenic has been absorbed in sufficient quantity to destroy life. Such an untoward result probably only occurs when certain well-known precautions are disregarded, as the absorption of the arsenic can be effectually prevented if sufficient be employed to excite active inflammation, for inflamed tissues lose the power of absorption more or less

completely. If enough be used to produce active inflammation, the patient is safe, but if through fear of poisoning too weak an application is employed, the most certain way is adopted of accomplishing what it is desired to avoid. Another precaution recommended by those experienced in the employment of arsenic is this: if the tissues to be destroyed are extensive, the arsenic should be applied to a part only of the surface at a time, and the cure be accomplished by several applications. When employed to remove large growths like cancer, if the skin be unbroken, incisions are first made, and into these the arsenical paste is laid. It soon excites deep-seated and active inflammation, and the growth dies for a considerable depth. Often the whole tumour sloughs away from the healthy tissues,—is enucleated, as it is said,—and leaves a clean and healthy sore, which heals without trouble in 15 to 30 days.

Lupus and other obstinate and local skin affections may be treated in the same way.

An arsenical mucilage of the following composition was much used by Dr. Marsden. Arsenious acid and powdered acacia of each an ounce, and to this is added five fluid drachms of water.

This he used to remove epitheliomatous growths. Some of this arsenical mucilage is to be painted over the tumour night and morning, taking great care to limit its employment to the diseased tissues. Each application is not to extend more than a superficial inch, is to be often repeated, and the separation of the sloughs aided by a poultice.

The following powder may also be used:—

Fresh lime, half an ounce, yellow sulphide of arsenic, 20 grains; starch, 180 grains.

This powder may be cautiously used as a depilatory.

In using any powder of arsenic to destroy the tissues, it should be seen that the arsenic constitutes one-fifth or one-sixth of the powder. Of such a strength, it will be sure to excite sufficient inflammation to prevent the absorption of the poison.

Mouth.—Arsenic has a sweetish taste. In moderate doses it apparently neither suffers, nor produces any changes in the mouth. It is employed as an escharotic by dentists to destroy

the exposed pulp of decayed teeth, and so to relieve pain when this is present, or to destroy the pulp before the tooth is stopped. If used to remove pain, the arsenic may be mixed with some opium. The pain is sometimes at first aggravated.

As cigarettes arsenic is smoked, and its vapours drawn into the lungs to prevent an attack of asthma. It is scarcely necessary to remark care must be exercised in their manufacture.

Trousseau advised smoking cigarettes made of paper "saturated with a solution containing half a drachm, or a drachm of arsenite of soda in three drachms of water. Such inhalations we should suppose might be mischievous, unless closely watched." (Stillé.)

These cigarettes may be used in chronic phthisis.

Arsenic in medical doses may, with very great advantage, be employed when the mouth or throat is attacked by sloughing, malignant sores, as cancrum oris, malignant sore throat, and the like. It is also useful in chronic coryza, especially that form of the disease which present the following characters. The patient is, perhaps, every day, or even several times a day, subjected to an attack of incessant sneezing, accompanied by much running of both the eyes and nose, and sometimes severe frontal headache. Each attack may last several hours, and the disease continue for years. Much assistance in its removal may be obtained from a drop of the solution of arsenic administered three times a day. (See Camphor).

Stomach.—What changes the arsenic compounds suffer in this organ, is at present unknown. There is no proof, that like most other metals, it combines with albumen to form an albuminate. From the similarity in the action of all arsenic compounds which can be dissolved, it is possible they either in the stomach or the blood ultimately assume the same composition.

Metallic arsenic, like the oxide, is poisonous; it is probably first oxidized, and then becomes active. Pure sulphide of the metal is inert, but as it very generally contains a not inconsiderable quantity of the oxide, it very often is found to be poisonous.

It has been maintained the condition of the stomach controls the action of arsenic on the system in the following way :—

If food be present, the medicine is absorbed by the lacteals, and through them becomes mixed with the blood, while, if the stomach be empty, it is absorbed by the veins, and passes into the liver, by which most is again separated with the bile.

In small medicinal doses the arsenic excites a feeling of warmth at the epigastrium, and gives rise to a sensation of hunger. Indeed it is maintained by many persons that these preparations are able to promote digestion, while they also increase the appetite. Other people as strenuously deny this assertion. It will be shortly seen that arsenic in certain diseases of the stomach, may, by removing or lessening what is wrong, promote digestion, and in this way also the appetite.

There are few remedies more useful in many diseases of the stomach than arsenic. In the so-called irritative dyspepsia, where the tongue is furred, and its papillæ red and prominent, a drop of the solution of arsenic taken shortly before food, will be found of great benefit. It is able with almost unfailing certainty when administered in the same quantity, and at the same time, to arrest the distressing vomiting of drunkards. This usually occurs in the morning and before breakfast. It is accompanied by great straining and distress, but generally very little, and sometimes nothing is ejected. In the latter case it is called dry vomiting.

The vomited matters are generally intensely bitter and sour, and of a green colour. To arrest such a symptom there is no remedy like arsenic.

In this disease it also improves the state of the stomach, and so often restores both appetite and digestion.

In chronic ulcer and cancer of the stomach arsensic is invaluable, by curing the pain and checking the vomiting of these complaints.

The author has seen this metal give relief in chronic ulcer, when the more commonly used remedies had failed.

By the influence of this medicine on the diseases which have

just been mentioned, it not uncommonly removes heartburn, and other distressing sensations of the stomach.

Persons who suffer from chronic vomiting, and who reject their food after most meals, but without pain and with scarcely any nausea, with whom the food simply regurgitates into the mouth, and is rejected with little trouble or annoyance, are much benefited by small doses of arsenic.

It has been recommended in the vomiting of cholera.

The solution of arsenic, given as above described, is always of service in that form of chronic dyspepsia and diarrhœa which is characterized by the following symptoms :—There is a sinking at the pit of the stomach, which is relieved by food, but immediately this is taken, nay, even while it is being eaten, there is an urgent desire to relieve the bowels, which may compel the patient to leave the table. The motions then are solid, or semi-solid, and usually contain lumps of half digested food. The disease appears to depend on a too great peristatic action of the stomach and intestines, whereby the food, before it is digested, is driven from the stomach to the intestines, and thence expelled. This is a form of diarrhœa common with children eight to twelve years of age. It may last many months. By the use of arsenic, in a few days the interval between the meal and the evacuation is much prolonged, and at the end of a week or ten days the disease is removed.

The author has always given the medicine, in one or two drop doses, shortly before each meal. (See Opium.) Arsenic will often be found of service in other chronic forms of diarrhœa, even when this is owing to serious organic disease, as the ulceration of phthisis, &c.

The testimony in favour of the employment of this remedy in cholera is very great. It is especially recommended in the later stages of the disease, when there is much collapse.

Arsenic freely enters the blood, but what changes it effects in it are unknown. It has been detected in this fluid and in most of the organs of the body.

It is strange how different are the statements of the effects of

arsenic if it be taken for some time, and although the opposed statements cannot at present be reconciled, no doubt both are true.

There is no doubt some animals, as the horse and sheep, are able to take considerable quantities of arsenic, not only without harm, but with apparent benefit.

It is also now established beyond reasonable doubt that in some parts of lower Austria, as Styria, many of the inhabitants are accustomed to take considerable quantities of arsenic, sometimes as a condiment with their food. It is said to be eaten often with cheese. They usually begin with a small dose, and this they take once or twice a week. The quantity is gradually increased, until half a grain, or a grain, or even more is taken at one time, and by custom this produces no untoward symptoms. The purpose for which it is eaten is a two-fold one. By the women, and even by the men, it is employed to give clearness to their complexion, and to improve their personal appearance. The success is said to be great. By the men it is more frequently used to confer on them, as they assert it does, the power to undergo great exertion without fatigue. Under the influence of the arsenic, they maintain they can climb mountains and accomplish tasks which without it would be impossible, from the fatigue which would result. The experience of most countries is opposed to the statements just made, for it is generally found by the continuance of arsenic no tolerance by the system is obtained, but, on the contrary, the most serious consequences are sure to follow. But in those countries where arsenic eating is practised, the habit is not without risk, as it is a general opinion in those neighbourhoods that many persons fall victims to the habit. The following explanation of the foregoing discrepancy has been advanced. The arsenic, it is said, is taken in a very insoluble form, and is not absorbed at all, but passes out with the motions, and leaves the system unaffected for either good or evil. This supposition has been effectually disposed of by Dr. Maclagan's investigations. Thus he witnessed the eating of the arsenic by a well-known arsenic eater, and afterwards collected his urine, from which a considerable quantity of the poison was obtained.

The following is a concise account of the consequences witnessed in this country from the long-continued use of arsenic:—

The digestion is soon disarranged, but much earlier in some persons than in others. The appetite fails, there is a feeling of weight or actual soreness at the pit of the stomach, which is increased each time food or the medicine is taken. The mucous membrane of the mouth and throat is unusually dry, and there is consequently experienced great thirst, and a feeling of burning in the throat and down the neck. The voice becomes rough, and in some cases salivation has been noticed. Ulcers may form in the mouth. There also occurs nausea, with vomiting and diarrhœa. The motions may be slimy and bloody, and be voided with much straining and pain. Cough, with bloody expectoration, may occur. With these serious symptoms the patient wastes away, the skin becomes dry and hot, and the pulse frequent, especially at night.

The sleep is much disturbed by dreams. There may occur palpitation, with a feeling of distress at the præcordia. Dropsy then appears, and there is often early noticed œdema of the eyelids, with redness of the eyes, nose, and lips. The eyes are suffused, and often smart. The dry and dirty-looking skin is often covered with eruptions and ulcers, which have been likened to eczema, and called arsenical eczema, and a slight brannyness of the skin has been described by Mr. Hunt. The hair, and even the nails, sometimes fall off. With the great emaciation there occur pains in the limbs, tremblings, and even paralysis, till at last the memory fails, sensation is lost, and death soon follows. These symptoms do not always occur in the order in which they are here set down, but sometimes one set appear earlier than another. The œdema of the lids, with redness and smarting of the eyes, is one of the earliest signs of the poisonous effects of the drug.*

After large doses, the symptoms of acute poisoning are obtained. The poison acts as an irritant to the whole digestive

* The above description has been chiefly taken from Buchheim's excellent work.

canal and excites in its delicate mucous membrane very active inflammation. There consequently occurs the symptoms which would be expected with a severe inflammation of this tract. But, strange to say, the symptoms which are observed to follow on a large poisonous dose are not invariably the same. Those of acute inflammation of the digestive canal are most common, and life is destroyed in four or five days. But it sometimes happens that such symptoms are almost or entirely absent, and there occurs sleepiness and profound coma, from which the patient never wakes, but dies in a few hours, and in such deaths, the mucous membrane of the stomach and intestines may be free from all inflammation. Sometimes the symptoms may be very like those of English cholera. (Guy.)

Arsenic produces, as is well known, its local effects on the digestive canal, even when injected into the blood, or applied to a wound, and then arsenic is found in the intestines, and hence this is one way in which the poison is eliminated from the system. It is said the effects on the stomach and intestines are as great when the metal is introduced by injection, or through a wound, as when swallowed. This is perhaps hardly true.

From the foregoing facts, it is evident arsenic has an especial affinity for the mucous membrane of the intestinal canal.

The following is a concise account of the post-mortem appearances in acute poisoning by arsenic :—

After death from arsenic there is found much inflammation of the stomach, often in patches, in contact with which arsenic powder can be seen embedded in the thick viscid mucus. Harley maintains its action is most marked at the cardiac end of the stomach. There are not unfrequently spots of ecchymosis, and less commonly ulcerations. Perforation is rare. The æsophagus and intestines may also be inflamed, and the rectum is often especially so, as also is occasionally the mouth, fauces, and even windpipe. The bladder has also been found in a similar state. As has been mentioned, all traces of inflammation may be absent when symptoms of such have been present before death. This absence of inflammation in such instances cannot be explained by a want of time for the arsenic to act, as severe changes

may be produced in the mucous membrane in the most rapid cases.

Death may occur in two hours. Ecchymosis under the lining of the cavities of the heart is commonly met with, and it is said the liver, heart, kidneys, and other structures are affected as by phosphorus, and are in a condition of advanced fatty degeneration. Such changes may be accomplished in a few hours. Ether and chloroform are said also to produce similar effects.

It has been asserted that arsenic in moderate doses gives fulness and increased strength to the pulse. From Harley's observations it appears that poisonous doses soon stop the heart, or rather the heart ceases sooner to beat after death in animals poisoned with this substance, than in those destroyed by mechanical means.

By some medical men arsenic is given to persons prostrated by acute febrile diseases. It is stated in such to strengthen the pulse, moisten the skin, and to invigorate the patient.

Its influence on the lungs, from the experience of the inhabitants of Steyermark, is to make the breathing freer; for it is said persons who take it can climb heights and undergo great exertion without distress of breathing.

Arsenic has long been recommended, and is an excellent remedy, in spasmodic diseases of the lungs. In asthma, whether dependent on emphysema or not, this remedy is often useful.

Some persons with emphysema, on catching cold, are troubled with slight wheezing at the chest, with difficulty of breathing, especially on exertion, or at night time, and are obliged, in consequence, to be partially propped up in their bed. Such persons often find great relief from arsenic. It appears to be of little service when there is very much bronchitis, or when the paroxysms of dyspnœa are very violent. In the latter circumstance, lobelia or belladonna are to be preferred.

The arsenic is especially useful in the above cases, where the difficulty of breathing can be connected with the retrocession of a rash, as eczema. The wheezing, with oppression of the breathing, which affect some children for months, and even years, may very generally be much relieved by arsenic.

The carbonic acid separated by the lungs is lessened by arsenic. The good influence of this remedy in certain skin diseases is universally recognised. This is most conspicuous in the scaly eruptions and chronic eczema. Lepra almost always yields to it, and its power over other forms of psoriasis is hardly less marked. Many cases it cures, others it improves, but a few it leaves unbenefited.

Hunt, who has had much experience of this remedy, lays down many excellent rules for guidance in its employment. He recommends small doses as capable of effecting all that is possible by arsenic, and discountenances the practice of gradually increasing the medicine. If the physiological effects of the drug arise, he advises the lessening, but not the discontinuance of the arsenic.

The following observations are taken from Mr. Hunt's work:—

Arsenic is hurtful during the inflammatory stages of eruptions.

Children, above five years, will bear nearly as large a dose as grown-up people.

At an age between eight or ten years and puberty, children, and girls especially, often require double the usual dose.

If continued for some time, "the trunk of the patient first, and subsequently all those parts of the body protected from the access of light and air, become covered with a dirty brown, dingy, unwashed appearance, which, under a lens, reveals a delicate desquamation, and is, in fact, a faint form of pityriasis." This disappears when the medicine is discontinued.

Hunt speaks of a form of lichen produced by arsenic, and also of certain idiosyncrasies occasionally seen, for some persons are easily, others with difficulty, affected by arsenic.

Hunt further advises:—

It should never be given on an empty stomach.

It should never be given in increasing doses. This, he states, is a fatal and almost universal mistake.

The largest dose ever required is, five minims, repeated three times a day.

This, if mixed with the food, will not irritate the bowels, but will, in the course of a few days or weeks, produce an itching or smarting in the conjunctiva. This membrane will appear slightly inflamed, and the lower eyelid will become a little puffed or swollen. The cutaneous disease will now begin to decline, and the dose must be reduced to four minims.

If the conjunctiva continues much inflamed, the dose must be further reduced, but the conjunctiva should be kept affected throughout the whole course.

If the skin becomes more inflamed, the course must not be interrupted, but an occasional aperient exhibited.

The arsenical treatment must be continued for as many months after the final disappearance of the eruption as it has existed years before.

These rules closely correspond to the advice given by Dr. Graves in his clinical lectures. With one statement, made in this "code of regulations," the author's experience does not quite correspond. He has not found the smarting of the eyes and swelling of the lower lid to occur so often as Mr. Hunt implies, and neither is it necessary to obtain these physiological symptoms before the good influence of the remedy on the eruption is apparent.

The first influence of the medicine on the eruption of psoriasis is to make it redder and more inflamed, to make it look worse than before the medicine was began. This fact, if not known, would lead to the suspension of the drug just when it commenced to do good. If the remedy be continued, soon the redness declines, the eruption begins to heal in the centre, and in a short time only a slight redness is left.

Chronic eczema, although perhaps not so amenable to the arsenic as psoriasis is very generally well treated with it. It is best suited to the obstinate chronic forms. It sometimes removes the troublesome eczema which attacks the vulva, the verge of the anus, and the scrotum.

Patients with pemphegus may most generally be cured of this troublesome disease by arsenic; and, although the rash is very

liable after a variable interval, to return, it may be again removed or prevented by a renewed recourse to the medicine.

Lichen and other obstinate skin affections are not unfrequently influenced for good by the same remedy.

There are few, if any, remedies so successful in chorea as arsenic. It is true, if there be much anæmia, iron is required; and if there be fever or rheumatism, these complaints must be subdued by appropriate treatment. But, in simple uncomplicated cases of chorea, arsenic is by far the best known remedy. Its want of success is sometimes owing to the smallness of the dose in which it is given, and it not uncommonly happens for decided improvement at once to begin with an increase of the medicine. Four, five, or more minims of the solution should be given to children with chorea, if the complaint has resisted smaller quantities.

Arsenic has been found of service in epilepsy and neuralgia. It is not unfrequently serviceable to those persons who suffer from a dull throbbing pain over one brow. Such a pain, however, is still more generally removed by Cannabis Indica. With the exception of quina, there is at present known no drug so powerful over intermittent fever as arsenic. By some persons who have had very large experience of this disease, this remedy is considered quite equal, if not superior, to bark, and by these, it is maintained the disease seldom is able to resist arsenic. Most observers do not admit such virtues to arsenic, and maintain that cinchona arrests the disease quicker and with more certainty, and is thus to be especially preferred in those malignant forms, which, unless at once arrested, speedily destroys life. Arsenic, from a concurrence of testimony, appears of most service in quartan ague, and when the disease is of long standing.

This remedy is sometimes able to arrest or control rheumatoid arthritis, and nodosity of the joints. It cannot, however, be at present employed with certainty of relief, as we do not know what are the circumstances of the disease which indicate its use.

Like other metals, arsenic remains a long time in the body.

It is, however, more quickly eliminated than some, as lead. Some maintain it is to be found, after its employment, in the bones as arseniate of lime. This statement is denied by others. It may be detected in the milk of women.

In the blood it is found chiefly with the red corpuscles. It is separated from the body by the urine, the stomach, and intestines, and, perhaps by the liver. After poisoning with arsenic, the metal is found in the latter organ in larger quantities than elsewhere. It may be, that like many other metals, it is separated from the body with the bile.

Its influence on the composition of the urine is unknown. Some experimenters assert the urea is lessened, as also is the carbonic acid separated by the lung, and hence they conclude the tissue metamorphosis to be very considerably diminished by arsenic. Vogel observed hæmato-globulin in the urine of an individual poisoned with arseniuretted hydrogen.

Arsenic acid is maintained, by Dr. Garrod, to be less irritating to the stomach than arsenious acid.

COLLODION.

Collodion is used for a variety of purposes. It has been employed for chapped hands and chapped nipples, but other remedies have superseded it in these diseases; for chapped hands and lips are better treated with glycerine of starch or arnica cerate, or two parts of eau de Cologne and one of glycerine. Chapped nipples are very often obstinate to heal, and if other treatment, such as equal parts of sulphurous acid and glycerine, &c., fail, then collodion may be resorted to.

Collodion is used to bring accurately together the edges of cuts and wounds, and, at the same time, to exclude the air from them. They can be better treated, in most instances, by Lister's carbolic acid method.

Collodion may be painted over patches of erysipelas, when the disease is superficial, and over those of herpes before the vesicles are developed. In both these diseases this application

will do good, but in most instances, from the movements of the part over which it is painted, the collodion coating cracks, and then loses its virtues. It is inferior, as an application in the diseases named, to a strong solution of nitrate of silver in water or nitrous ether.

Collodion may be painted over superficial burns, and will ease the pain, subdue the inflammation, and lessen vesication. Here, again, nitrate of silver is to be preferred.

Dr. Hare, the author believes, was the first to recommend collodion in the treatment of boils. It is not, however, useful in all forms of boils, as these disagreeable formations may begin in several ways. In some instances, there first occurs a small pimple that soon maturates and forms a pustule, around which the inflammation extends till a hard red painful swelling occurs, the centre of which dies, and a core is produced. This is the common form of boil, and the one which may be successfully treated with collodion. If at the very commencement of the inflammation, and while still the papular stage only is reached, the inflamed part be painted over with collodion, the boil is very generally completely arrested and dies away. For, by this application, the swelling and hardness around the papule diminish, while maturation is promoted, and no further extension of the inflammation occurs, and thus, instead of a large and painful boil, there occurs only a small pustule, which gives very little trouble. The disease is arrested in the pustular stage. It is important when the pustule is formed, not to remove the collodion and clear out the matter, for if this be done the inflammation at once begins again, and proceeds to the formation of a boil, to prevent which the collodion was applied. It is desirable, from time to time, to apply a fresh coating of collodion, and to allow these to remain on the skin till the pustule has dried up, and the sore it has made is healed. By this treatment the intense irritation, which often accompanies the papules and pustules, is at once removed.

Dr. Hare is of opinion the contractile collodion should be employed, and attributes much of the success of this application to the pressure which it exerts.

The flexible collodion the author has found succeed, although it may be the contractile preparation would have answered still better.

Collodion and solutions of gutta-percha or india-rubber in chloroform, are able to prevent the pitting of small-pox. If collodion is used the flexible variety is preferable.

A mixture of collodion and carbolic acid is useful in stopping the pain of a decayed tooth, when the pulp is exposed and inflamed.

The preparation is thus made:—First, melt in a test-tube some crystallised carbolic acid, and to this add an equal quantity of collodion. These are to be well mixed, when they speedily set into a jelly, some of which, on a small piece of cotton wool, is to be inserted into the hollow, painful tooth. At first the pain is aggravated, but in a few seconds it grows less, and soon ceases altogether.

COD LIVER OIL.
ALMOND OIL.
POPPY OIL.
HEMP-SEED OIL.
LINSEED OIL.
COCOA NUT OIL.
DUGONG OIL.
PALM OIL.
LARD.
SUET.
WAX, &c.

These substances, in one form or the other, are found abundantly in both the animal and vegetable kingdoms, a circumstance which shows their great importance in organic life. To the animal body they are necessary as food, being heat-giving, plastic, and force-supplying substances.

By their combustion they contribute largely to support the heat of the body. They are also necessary to tissue formation,

and without them growth and nutrition would probably be impossible, or, at least, would be very imperfectly performed.

By their combustion they, moreover, supply most of the force which is appropriated by the nitrogenous structures, and through them converted into muscular force, secretive force, nerve force, &c.

All fats have, for the most part, the same physical properties; they differ only in their melting point. In chemical nature, however, they differ much one from the other, and hence are probably, after their entrance into the blood, changed in character, and converted into fats, having much the same composition.

To the skin fats and oils of different kinds are employed for a variety of purposes.

They are used to lubricate and make it more supple when, from any cause, it has lost its elasticity, and has become dry, hard, and liable to crack. They are thus used in many of the scaly diseases, as psoriasis and xeroderma. They should, in such complaints, be employed in conjunction with warm-baths.

Fats are, moreover, rubbed on the surface of the body to prevent irritation by such excreta as urine or fæces, or by acrid discharges as occur in eczema. When used for this protective purpose, some stimulating substance, as the oxide of zinc, is very generally added to them.

Oils are sometimes diligently rubbed into the skin of the whole surface, to prevent the sweating which accompanies exhausting diseases, as phthisis. While occasionally successful, this method is inferior to the sponging of the skin with a weak acid wash, and to other methods.

In rare instances, fats have been rubbed on the skin that they may be absorbed, and so become of general use to the body. It need scarcely be said this method of administration is far inferior to the plan of giving them by the mouth.

It was a custom with the ancient Romans during the decline of Rome, at the time when warm-baths were so much indulged in, to check the profuse sweating caused by this enervating habit, with inunctions of the surface with fats.

Fats or oils are frequently used as the vehicle of other medicines, when it is desired to apply them to the skin for any purpose.

It is a very useful practice to rub the hands and feet of persons suffering from scarlet fever or measles with some firm fat, which application removes the troublesome feeling of heat and tightness the rashes of these diseases produce. It has been asserted, if the body be rubbed over with fatty substances, a considerable fall in its temperature occurs. This statement the author found, in one instance in which it was tested, to be incorrect.

It has been recommended to treat scarlet fever solely, or chiefly, by such inunctions. This treatment is said to lessen the fever, and to curtail the disease.

In the mouth these substances, if pure from admixture, and if not rancid, are tasteless, but they always contain other substances mixed with them, or if they be rancid, they possess different and generally characteristic flavours. They are not used topically for diseases of the mouth, neither do fats experience any alteration in this cavity. In the stomach they are almost as little affected. If enclosed in albuminous walls, as when in the form of cells, by the solution of these the fat of the cell is set free. On their part, however, they are not thus inert towards the other contents of the stomach, as it is generally accepted that fats assist those chemical changes which constitute digestion, and so help the solution of the nitrogenous food. As bearing on this subject, fats, it may be mentioned, by their presence, assist the fermentation of milk, and of sugar and starch, and also promote the digestion of food in artificial digestion. How they accomplish this function is unknown; and whether they themselves are in any measure changed in constitution at the same time, are questions at present quite unsettled. The importance of this property of fats must be sufficiently apparent, and needs no further comment. In large quantities they hinder digestion, very possibly by their decomposition, and the formation of acids foreign to the stomach.

In the intestines these substances suffer a variety of changes, and, among others, they are absorbed both by the lactates and

veins, but the manner in which this is accomplished is still an undecided question.

By the alkaline pancreatic juice, they are emulsionized, and it has been thought that in this way their absorption is facilitated; but it is difficult to understand how mere division should assist their passage from the intestines to the blood; and, further, it is maintained if the pancreatic duct be tied, animals remain as fat as before.

It has been surmised the fat may become saponified, and so pass through the walls of the intestines into the blood. A small part does, probably, pass in this form into the circulation, but as much unsaponified fat can be seen in the epithelial cells covering the villi, as well as extracted from the chyle, the chief part must be absorbed in another manner.

To the action of the bile is probably most justly to be ascribed the passage of fats through the moist animal membranes forming the intestinal canal.

In support of this assertion, it may be advanced—

I. While fats rise scarcely at all in capillary tubes moistened with water, if moistened with bile, they rise from 12 to 14 times higher.

II. It has been experimentally proved, that while fats pass with extreme difficulty through moist animal membranes, their passage is made easy if these be moistened with bile.

It is probable, then, the bile is the active agent in promoting the absorption of fats. There are other reasons for this assertion, but it is not necessary to mention them here.

To a small extent, the fats can pass into the blood by the agency of the intestinal juice.

Chief of the fat passes into the lacteals, a little into the veins; this latter is conducted to the liver, and there is converted (or at least, probably the oleic acid is) into cholic acid. This unites with the soda set free, when the hydrochloric acid of the gastric juice is poured into the intestines, and so forms a kind of soap, namely, the taurocholate and glycocholate of soda.

These are returned again into the intestines, and after serv-

ing in it their destined purpose, the base again re-unites with the acid of the gastric juices from which it was previously separated.

The influence of fats on the secretions of bile varies according to circumstances. If taken on an empty stomach, it lessens it. If, on the other hand, it be taken with or after food, it increases it.

As the bile is very much increased by food, we have an indication which is abundantly corroborated by experience, to give fats either with, or soon after a meal.

The melting point of fats must influence their absorption, for if their melting point be below the temperature of the body, they must remain unabsorbed, unless dissolved in the more liquid fats.

By the stomach, animal fats are far more tolerated than vegetable ones, and can be continued for a longer time, and also be given in larger doses, circumstances which must explain in some measure, the superiority of animal over vegetable fats as medicines.

There is a limit to the quantity which can be absorbed by the body. At first but a small quantity is taken up, and it happens very generally, for some weeks after cod-liver oil is commenced, that some re-appears in the motions. By custom, however, more and more is absorbed, till very large quantities may be taken, and find an entrance into the circulation. If too much is administered, it is liable to decompose, and to form acids hurtful to the body, and hence to excite nausea, vomiting, colic, and diarrhœa. The foregoing circumstances, namely, the limit to the quantity absorbed, as well as the irritation caused by any excess which remains in the intestines, are sufficient reasons, without economical ones, to make it very undesirable to give more fat than can be appropriated. By examining the motions, day by day, we can at any time learn if too much is being administered. Too large a dose is not merely wasteful, it is also harmful.

If there be present in the intestines a catarrhal condition of the mucous membrane, but little fat is absorbed.

Oils have been employed with the hope they might form a

protective covering to the mucous membrane in poisoning by irritating substances, but it is impossible for oils to thus coat a membrane moistened with water.

In the lacteals and blood-vessels, the fat is speedily saponified, and most of it in the blood-vessels appears to collect in the blood corpuscles, and may play a part in their formation and growth, &c.

In the system, fats, as we have said, are heat-giving, plastic, and force-supplying.

By their oxidation, they, in common with other combustible substances, uphold the temperature of the body. This, though an important function, is not their only or their most valuable one.

Fats, like phosphate of lime, are necessary to both growth and nutrition, for in the most vitally-endowed organs these fats are found in excess and wherever cell-growth progresses rapidly, fats abound, and this applies to both health and disease, for much fat is found in rapidly-growing cancer, and, moreover, it is found associated with the more highly organised constituents. Thus in pus the chief of it is associated with its corpuscles, and comparatively little is found in its serum. More fat is found in plastic than non-plastic formations. In fact, observations every day demonstrate more and more the importance of fats as tissue-forming substances. These facts obviously bear on the application of the members of this group in disease; but we shall return to this subject shortly.

From recent observations, it is probable fats are force-yielding substances, and that the peculiar forces of the body are in the main derived from the fats we eat. But a short time ago, it was considered all the forces of the body were derived from the combustion of the nitrogenous structures of the body; but many circumstances tell conclusively against this assumption.

1. After severe and prolonged exercise, the urea of the urine is scarcely increased, and as this substance is a measure of the consumption of nitrogenous materials, *ergo* these are at such times but little consumed.

2. Enormous quantities of carbonic acid are, at times of exer-

tion, exhaled from the lungs, which indubitably point to the combustion of some carbo-hydrates, or of fatty substances, as the urea is at the same time not increased.

3. This combustion does not chiefly occur in the blood, but in the muscles themselves; for when these are separated from the body, and made to contract under a bell-glass, they are found, during the time of their activity, to yield an enormous quantity of carbonic acid.

4. It has been found by experiment, that great exertion and prolonged labour can be endured without fatigue, when starchy and fatty foods are alone eaten, while at the same time the urea of the urine is but little increased.

It must be apparent that we obtain a clue from what has preceded, in the employment of fats. For it has been seen they are necessary to growth, nutrition, and the production of functions; and when it is added, that by supplying to any tissue the particular food it requires, we can promote in it assimilation and functional development, it is evident whenever it is desired to promote vigour of nutrition, fats are indicated. Hence they are peculiarly suited to convalescents from acute general diseases, and in such very considerably aid restoration to complete health.

But fats are also useful in many chronic affections, as is seen in the following remarks:—

After many acute inflammations, as the kidneys, heart, or lungs, on the subsidence of the acute disease, a more chronic, but not less fatal one may be left. The danger of this is in proportion to the health of the person previous to the acute attack. If this has been impoverished, or if the person be the subject of tuberculosis or of scrofula, many sequelæ are liable to remain. Hence it is found, that in middle-aged and old people, in whom nutrition is less active than in children, chronic diseases are more liable to follow on acute ones. There is also such a danger with children, if their previous health has been impoverished by unhygienic conditions of life. The production and continuance of the chronic malady depends on deficient nutrition, and any circumstance which shall assist to remove this will shorten and

help to remove the chronic affection. As fats are peculiarly able to promote nutrition, they are especially useful in such chronic maladies.

The dependence of chronic affections on the state of general nutrition may be shown in another way. Many persons suffer from some slight local affection, which troubles them but little while the health is good, but—on the principle that the weakest link of the chain is the first to yield—if this from any cause becomes deranged, the local malady is immediately aggravated.

Thus, many persons can measure the state of their general health by the condition of a local disease. Here, again, any circumstance or treatment which will restore the general health will also reduce the local affection to its former unimportant state. In such a case, there is often an indication for cod-liver oil.

From these remarks we learn, what experience confirms, the usefulness of cod-liver oil in many chronic inflammations, as of the heart, lungs, and kidneys, and also in the sequelæ of the acute specific diseases, as the chronic discharge from the ears or nose so often left by scarlet fever or measles.

The chronic degenerative diseases of old age may also be usefully treated by the same remedy.

The complaints in which cod-liver oil is especially useful will now be spoken of in greater detail, and it will be seen both it and phosphate of lime are, for the most part, useful in the same affections. Theory and experience have alike shown this.

Cod-liver oil is of especial service in scrofula, and in the removal of the various manifestations of this disease, as chronic discharge from the ears and nose, strumous ophthalmia, strumous disease of the bones, strumous abscesses, &c.

In the treatment of phthisis, it stands pre-eminent. The term phthisis, however, includes many and different diseases. For our purpose it is sufficient here to divide them into the febrile and the non-febrile varieties—those forms in which there is preternatural heat of the body, and those in which the temperature is natural, or is raised only occasionally, and for a very short time.

The fever-forms of phthisis will first be spoken of. The existence of fever is by no means an indication of the uselessness or harmfulness of cod-liver oil, for many persons in such a state are very considerably benefited by its use. In this form of phthisis, as, indeed, with all other diseases, we must be guided, not by the nature of the complaint alone, but in the employment of these remedies must have regard also to the state of the patient in other respects. If the digestion be good, cod-liver oil may generally be given with advantage; but if the stomach is irritable, then, by still further disordering it, it does harm.

In the chronic forms of phthisis, cod-liver oil very generally is well borne, and does great good; but, as with the more acute varieties, it sometimes happens the stomach is upset by it, when it does harm.

It is very generally held that diarrhœa in this disease is a decisive symptom against the employment of the oil. This is only a part truth. No doubt cod-liver oil sometimes increases the diarrhœa, but this can sometimes be explained by the largeness of the dose, or the frequency with which it is given, for it often happens the diarrhœa is even controlled by cod-liver oil, if only a teaspoonful is given at a dose, once or twice a day. It is a good plan, in cases of phthisis with diarrhœa, to begin the use of oil with caution, and then, if it suits, it may be given with greater freedom. An excellent method is to give a teaspoonful the last thing at night, immediately before the patient lies down to go to sleep. In this way oil may often be tolerated without producing either nausea or diarrhœa, when previously either or both of these unwished-for consequences were occasioned by it.

As might be expected, the early forms of this disease are most benefited by the use of oils.

It is said most good is obtained from them by phlegmatic people with sallow skins and dark complexions, and less by those of a sanguine temperament with florid complexions.

Cod-liver oil is often found of very great use in chronic rheumatism, rheumatoid arthritis, chronic gout, chronic skin affections, syphilitic or otherwise. It is also particularly useful in

emphysema of the lungs and chronic bronchitis, in the former checking degeneration of the lungs, in the latter controlling expectoration.

Many persons, especially the aged, complain of much sinking, or a feeling of "craving" at the epigastrium. Sometimes this is connected with atonic dyspepsia, and sometimes is dependent on the general state of health. This sinking, if the intestinal canal be not in an irritable condition, may be removed by the use of cod-liver oil.

The same symptom is sometimes complained of by middle-aged people, who suffer from that anomalous group of symptoms called hysteria. In such it may be removed by oil, while, at the same time, the other symptoms are often lessened.

Giddiness in the old, when not due to serious organic disease of the brain, but probably on atheromatous changes in its vessels, or on a weak heart, is often best treated by cod-liver oil and quinine.

Fats prove of especial use in the chronic diseases of children, which follow on mal-nutrition, as in children it is easy to restore the nutrition and growth to the healthy state, and when such is accomplished the local malady will generally disappear.

The after stages of whooping-cough, laryngismus stridulus, rickets, chorea, and chronic coughs are often made milder, and curtailed by the employment of cod-liver oil.

The obstinate constipation met with in children sometimes yields to oil, and its return is prevented while the employment of the oil is continued.

Children, in the following precarious state, may obtain much assistance from cod-liver oil. When, of a few months old, they may, by chronic diarrhœa of a few pale, stinking, pulpy motions daily, be reduced almost to a skeleton. Their skins are leathery and wrinkled. It may be their food is also rejected. When brought to this dangerous condition, thrush breaks out in the mouth. Such children should have given to them, in conjunction with medicine for the diarrhœa or vomiting, a teaspoonful or half a teaspoonful of cod-liver oil each night, before they are put aside to sleep. The quantity and frequency may afterwards be gradually increased. In such cases the oil neither

increases the vomiting nor the diarrhœa, while it greatly improves the general state of the child, promoting very considerably its nourishment and growth.

In this article hitherto all fats have, for the most part, been spoken of in common, but they certainly are not all equally useful in disease.

As has been said, animal fats are to be preferred to vegetable ones, and liver fats are generally considered superior to all others. Whether the oil from the liver of the cod fish is superior to that of the livers of other animals, is difficult to decide, as no doubt the cod-liver oil of commerce is derived not only from the livers of various fish, but also from those of other marine animals.

The superiority of liver oils has been thought to depend either on the iodine, the phosphorus, or the bile they contain. This conjecture is certainly wrong, as each of these substances is present in very minute quantities, and for a still more conclusive reason, namely, the effect of these substances on disease is dissimilar to that of cod-liver oil.

The explanation of the superiority of liver oils is to be found in the ease with which they are tolerated by the stomach, as they can often be taken for months or years without any inconvenience, while other fats and oils in a sort time excite nausea, and produce loss of appetite and diarrhœa. Moreover, there is reason to think cod-liver oil is more easily absorbed than other similar substances.

When first taken, cod-liver oil very generally excites nausea and vomiting, and disagreeable eructations. With some persons the difficulty to overcome the distaste for this medicine is almost insuperable. With most people, however, this dislike is soon lost, and in a short time the oil is taken even with relish. This is indeed often the case with children, who soon come to look on the oil as a treat.

The nausea and vomiting which this remedy often at first excites, can not uncommonly be explained by the largeness of the dose in which it is given. At first, only a teaspoonful, or even less, should be taken at a time, and if the stomach is intolerant of it,

this should be given only once a day. If great difficulty in retaining the oil is experienced, it is a good practice to take it at night-time, immediately before lying down to go to sleep. Dr. Foster of Birmingham also says cod-liver oil, if mixed with a few drops of spirits of chloroform, is better tolerated and absorbed than when given alone. By mixing the oil with lime-water, nausea, and even diarrhœa may in some instances be averted. But both of these methods, although sometimes successful, fail in most instances where the oil has not been previously tolerated. Cod-liver oil is often administered in large quantities, which can scarcely, even after custom be easily borne. It may take weeks, and even months before much oil can be digested and absorbed, and hence, if swallowed, it merely passes off by the motions, and is liable by its decomposition to disorder the intestines. As has been explained, the motions should be watched, and from the state of these, we can learn whether the oil is given in unnecessarily large quantities. It has been already explained that oils should be taken with, or soon after food.

Cod-liver oil may be taken on orange wine, or weak brandy and water. It should be so poured upon these, as not to touch the glass, but to float on the surface as a globule. It should then be tossed off, and some agreeable tasting food will completely remove any taste of it, if any has been experienced. A little salt taken immediately before and after the oil often removes the taste, and prevents nausea.

Fats as has been said are consumed in the body, but a small quantity sometimes escapes, as with the fæces, and with the urine. The quantity, however, in the latter is insignificant, unless in the disease called chylous urine, when fat is often present in considerable quantities. A little escapes in Bright's disease with the uriniferous casts in the urine.

CASTOR OIL.
CROTON OIL.

Both these liquids consist of a simple bland oil with a variable quantity of an acrid irritating matter, upon which most

of the characteristic properties of these substances depend. This is present in small quantity only in castor-oil, but in much greater quantity in croton-oil. In both it may be increased by the addition of an alkali. It is by this matter croton-oil can irritate the skin, and produce redness with vesication, and even if the application be a strong one, pustulation, which latter result is to be avoided, or scarring may be produced. It is well known the irritant action of croton-oil is increased by the addition of liquor potassæ, the effect of which has been explained just above. As a counter-irritant, croton-oil is employed, and with some persons enjoys great favour. It is difficult to understand in what way it is superior to a mustard poultice, to which application it is in one respect—an important one—inferior, namely, after the production of vesicles, the counter-irritation, even if it should be required, cannot be continued, while with mustard poultices, which do not when properly applied break the skin, the counter-irritation can be repeated, day by day for an almost indefinite period, provided the mustard be diluted with linseed meal or bread, or the application removed before much inflammation is produced. With some persons it is a common practice to rub the chest of patients, even children, with bronchitis or phthisis, with croton-oil liniment.

In the mouth, castor-oil, if pure, has no particular taste. Croton-oil on the other hand is possessed of an acrid burning taste.

Neither remedies are used for their topical effect on diseases of the mouth.

In the stomach they behave like other oils, but after large doses of croton-oil, inflammation of the stomach may be produced. In the intestines the bland oil behaves like other fatty substances, and if not quickly expelled from the intestines is absorbed, and serves in the economy the same purposes as other oils.

The acrid matters, however, irritate the intestines and excite in them a catarrhal condition, and hence act as purgatives. Their action in this respect is heightened by their admixture with the alkali of the bile, which we have seen increases their acrid pro-

perties. It is as purgatives these oils are chiefly used. Castor-oil for this purpose finds very frequent employment.

Its action is speedy, certain, and mild, for it produces very little griping, and one, two, or three stools only, and acts usually in two or three hours. Injected into the veins, it still acts as a purgative, it is said, and, if this be so, it must have an especial affinity for the intestines. On account of the above properties, it is commonly used as a purgative in fevers, with children, and women with child. Also in cases of piles, and fissure of the anus.

It is also the most generally employed purgative after parturition. With children, however, it is not a desirable purgative, as it always leaves the constipation worse than it found it.

Indeed, this is also the case with adults, and constitutes one of the strongest objections to castor-oil. Croton-oil is a much more powerful purgative, producing very watery stools, with much depression.

It is thus used in very small doses; but even these, from the uncertainty of the medicine, are not often given; but other purgatives are preferred. Where, however, it is important to administer the purgative in a very small bulk, croton-oil may be employed.

It is thus used in apoplexy, coma, and mania. It may also be given in cases of obstinate constipation, where other purgatives have been given in vain.

But its action is uncertain, for, in some instances, it acts in half an hour; in others it requires a much longer time, and, on some occasions, even large quantities, as 6 to 8 drops, have failed to purge altogether.

When given to persons who are insensible the usual way is to convey to the back of the throat some fat with the oil mixed in it, and to allow it to melt and be swallowed.

Its acrid taste makes it desirable, when given to persons who are conscious, to administer it in the form of pills.

Most of these oils pass off with the motions, as they do not stay long enough in the intestines to be absorbed. It is probable but little of the acrid matter passes into the blood, as it is only

after large doses that croton-oil by the mouth produces the same symptoms as when injected into a vein. They are never used for their direct action on the distant organs of the body.

As purgatives they indirectly influence distant organs, as for instance the kidneys, and act as diuretics. As a revulsant, croton-oil has been employed, but will scarcely find such an application in the present day.

It has also been used in hydrocephalus, and is asserted, in some instances, to have removed the fluid from the ventricles of the brain.

Cases of sciatica are reported, which have been cured by purging with croton-oil, and it is considered by some, this medicine is, in such a disease, superior to other purgatives.

Eight or ten drops of castor-oil, suspended in a little mucilage, is sometimes used to check the diarrhœa of children. This treatment certainly often succeeds, but it is a very unreliable one, and may be superseded by other methods which are more sure, and for which there are more certain indications.

It is a not uncommon habit in the early stages of diarrhœa, to administer a dose of castor-oil, or some other purgative to carry away the irritant, if there be any present, that has excited the diarrhœa.

A drop of castor-oil may be introduced into the eye when any fine irritant, as sand, by its presence is exciting pain. This application is soothing to the conjunctiva, and very greatly removes both the pain and intolerance of light.

Castor-oil may be taken in one or other of the following ways without much taste:—

It may be taken in beef-tea, highly peppered, and well salted.

Or the oil may be well beaten up with an equal quantity of the froth of stout, and the mixture be at once tossed off before the constituents have had time to separate.

GLYCERINE.

Glycerine is of great use as an external application. Thus, when the lips or hands are chapped, or when the skin is left rough, furfuraceous, and inelastic, as after eczema and some other skin complaints, glycerine, or, still better, the glycerine of starch, is a most admirable remedy. It quickly gives suppleness to the tissues, and removes the burning, tingling, or smarting which may be present. It should be mixed with an equal quantity of water, or, still better, of eau de Cologne, as without such dilution the tissues may be inflamed and made to smart. The glycerine of starch may also be used in xeroderma to make the skin soft and supple. A bath should also be taken each day, and the application applied after the body is wiped thoroughly dry. Glycerine is a good application to the meatus of the ear, when the tissues are dry, or when the tympanum is ruptured. In the latter instance it covers the opening in the tympanum, with a thin film, and so for a time supplies the place of the lost membrane.

In acute diseases, when the lips, tongue, and gums become dry and coated with dried mucus, these parts should be washed quite clean, and kept moist by glycerine. This greatly improves the comfort and look of the patient. The glycerine must be applied several times a day. It sometimes answers best when diluted with an equal quantity of water.

In chronic diseases, as phthisis, at their last stage, the tongue and inside of the cheek become dry, red, shiny, and glazed. This condition of the mucous membrane is very distressing to the patient, and is usually accompanied by great thirst. All these discomforts may be much lessened, and often entirely removed, by washing the mouth with glycerine and water. If the glycerine be used alone, it is liable to make the mouth feel clammy and sticky. If thrush has attacked the mucous membrane in the above-mentioned disease, this may be quite removed by the employment of the glycerine.

Glycerine of carbolic acid may be applied with advantage to

fœtid sores, such as open cancers, whether on the surface of the body or in the uterus. It removes the offensive smell of the discharge, and also improves the condition of the sore. Probably this preparation would be of use in Lister's most admirable method of treating wounds.

Glycerine of borax is a good application to pityriasis of the scalp; it may also be employed in aphthæ and thrush of the mouth.

Glycerine has been used in place of sugar, when it is considered this last-named substance will do harm, as in diabetes. It has also been recommended as a substitute for cod-liver oil, but experience has failed to support the recommendation.

One of the best preventatives of bed-sores is glycerine, or glycerine cream. The part exposed to pressure should, if possible, be washed twice every day, morning and evening, with tepid water, and carefully wiped quite dry with a soft towel, and then a little glycerine, or glycerine cream, rubbed gently over the part with the hand. If the part be at all sore or tender, the latter is best to be used. If there is fear of soiling the bed-clothes from this treatment a draw-sheet will prevent this, but it should be made of linen, and sufficiently large to tuck firmly in at both sides of the bed, as any folds or creases in the bed-clothes are very apt to cause irritation, and produce tenderness, and, eventually, sores. This treatment should be commenced before any redness or tenderness occurs, as it is preventative rather than curative.

ON THE DIFFERENT KINDS OF TANNIN. ON GALLIC ACID.

Applied to the uninjured skin, these substances produce little or no effect; but on sores and broken surfaces they act as astringents and contract the vessels, condense the tissues, and by these means check secretion. They also precipitate albumen from its solution, and thus coat over wounds and protect them in some measure from the injurious action of the air. For these properties tannin-containing substances may be applied to ex-

coriations, sores with profuse discharge, and to luxuriant granulation. It is generally most useful in the form of glycerine of tannin. In this combination it will be found of great use in ozæna. It not uncommonly happens after measles, or scarlet fever, or other diseases, for the inside of the nose to be excoriated, rather reddened, and to discharge freely a thin sanious, or thicker purulent fluid, which latter, on drying, blocks and scabs up the orifices of the nose; while, often at the same time, from the irritation of the discharge, the upper lip is covered with eczema. If the inside of the nose be well brushed out with glycerine of tannin, the discharge of either kind ceases, often, indeed, after a single application, and the parts heal and become natural again. If the scabs be thick and the orifices blocked up, these crusts must be thoroughly removed, so that the excoriated surface is left bare, which permits the preparation of glycerine to come well in contact with the sore and secreting surface.

The obstruction which so generally occurs in the nose of syphilitic children, and which causes in them the characteristic snuffling, may be removed by this treatment. After the application the child breathes much freer through the nose, and then can take the breast much more easily. For while the nose is blocked up the child cannot suck and at the same time take air into the lungs through the mouth, and so it constantly happens with syphilitic children that they cannot suck properly, in consequence of which they waste away.

Patients constantly apply for relief who suffer from a chronic discharge from the nose of a thick, lumpy, greenish-black matter, which may continue for years, and which not unfrequently has a most disagreeable smell. Such chronic discharges can very generally be speedily removed by this application; and even if it continues in spite of this treatment, the offensiveness of the smell is always destroyed. It is necessary that the cavity of the nose should be thoroughly washed out with the preparation.

The treatment is sometimes successful where alum and other injections and washes have failed to affect the disease.

The thin sanious or purulent discharge from the ears so

commonly met with in weak, unhealthy children, especially after they have suffered from a severe illness, can be stopped at once by filling up the external meatus with this liquid preparation of tannin. Usually one application is sufficient, but a slight discharge may remain, or it may return again in a few weeks, when it can be again removed by a fresh recourse to the glycerine of tannin. If there be acute inflammation of the meatus, it need scarcely be said this treatment is inapplicable until the acute affection has subsided and become chronic. The chronic vaginitis of children, with thick purulent discharge, can often be at once arrested by painting the affected parts with this application; it, however, not unfrequently proves more obstinate than either of the previously mentioned diseases.

This preparation is also of very great use in many cases of eczema. It is of service only in the earlier stages of the disease. Thus, when the skin is inflamed, red, swollen, and weeping, if the scabs be thoroughly removed, and the raw surface be painted over with this preparation of tannin, the discharge is stayed, the redness, heat, and swelling much lessened or removed, and the appearance of the parts much improved. When in a less active condition, and when the tissues are less red, swollen, and weeping, the eczema may more profitably be treated in the same way. The tissues assume a much healthier appearance, and after a few applications look like a healthy, healing sore. A poultice may be usefully applied at night, and this glycerine of tannin twice or three times in the day. All the advantages which accrue from its employment in this disease have not yet been mentioned, for the troublesome itching, and tingling, and burning so common in eczema, are at once removed by this application, and thus the tearing with the nails and rubbing with the hands which prevents the healing of the sore, and causes it even to spread, is prevented, and the comfort and well-doing of the patient much promoted, as the itching and feeling of burning often greatly break the sleep. Sometimes the glycerine of tannin does not, of itself, quite remove the disease, but brings it to the stage where there is only a little desquamation, with a tendency to crack and ooze. It may be necessary in such case

to perfect the cure by a resort to tar or by carbolic acid ointment. It need not be said that some cases prove incurable by this as by all other treatment. Impetigo may be beneficially treated in the same way. The scabs should be removed by a poultice applied each night, while this tannin preparation is employed during the day. In the treatment of these diseases of the skin by this application, the state of the digestive organs must not be overlooked, but anything wrong with them should, if possible, be removed.

The eczema which occurs behind the ears of children, and is often limited to these places, is most admirably treated with the remedy. It almost always dries up and heals after one or two applications, even when it has lasted for weeks or months. The gums, if red and swollen, should be lanced, or other irritations removed. Intertrigo of children may also be treated in this way.

It is an extremely useful application to the throat for a variety of purposes. It may be employed with great benefit to the throat when an acute inflammation has just subsided, as the mucous membrane becomes less red, less swollen, and moister, and is covered with mucus or pus. If the glycerine of tannin be then painted on the pharynx, &c., the recovery to their natural state is much hastened, and the chronic inflammation, with a relaxed condition of the mucous membrane, which sometimes follows the acute disease, is prevented. The superficial ulceration which may occur just as the acute conditions are subsiding, may be speedily healed by this application.

In chronic inflammation of the throat, when the mucous membrane is relaxed, moist, and granular-looking, or bathed with mucus or pus, the tissues may be speedily braced up, and these conditions removed, by a few applications of the preparation of which we are speaking, while the hoarseness which may accompany it is at the same time much lessened or removed. Such a throat is commonly met with in children, and is a cause in them of a frequent hacking cough, which may keep them awake for the greater part of the night. A speedy way to cure such a cough is to wash the throat with this astringent application.

Such a state of throat frequently causes slight deafness, a circumstance very common with children, and which may be removed with the chronic inflammation of the pharynx, by the employment of the glycerine of tannin.

It is well known that coughs are often dependent on the state of the throat. But while in theory this fact is very generally accepted, in practice it is very little applied.

In phthisis a frequent hacking cough is often dependent on the state of the throat, and can be allayed by this application. A good night's rest may be obtained by applying the paint just before going to sleep. A small quantity of morphia added to the glycerine of tannin still further increases its soothing sedative power on the throat. The paroxysms of whooping-cough may be most considerably lessened in frequency and violence by well sponging out the pharynx with this application; it should be carried low down, and be brought well in contact with the epiglottis and the neighbouring parts.

Its employment will be followed by no good results if the case be complicated with catarrh or other inflammation of the lung, or if there be present tuberculosis or other condition causing fever, or any irritation, as of teething. But in simple uncomplicated whooping-cough this application may be used with decided advantage. The paroxysmal cough which is often left behind by whooping-cough, or which speedily returns on exposure to cold, may be well treated in this way.

This application has the further advantage of causing no pain, and of not possessing a bad taste.

Glycerine of tannin may be painted on the mucous membrane of the mouth in ulcerative stomatitis, and is especially useful when this complaint is situated at the edges of the gums, where they give insertion to the teeth. Dried alum is, however, a still better remedy in this complaint.

The same application is very effectual in contracting an elongated uvula, and so removes the cough produced by the constant tickling at the back of the tongue, as also the frequent deglutition which this elongation may produce.

Tannin administered by the atomizer to the throat in diph-

theria and croup, has been highly praised by Trousseau for its power to control these complaints. The solution should contain five per cent. of tannin, and be employed from 15 to 20 minutes.

In the stomach, the tannin precipitates the soluble albuminous substance contained therein, and next acts in a similar way on the mucous coat, as on the broken skin.

Tannin containing substances therefore, if given in quantity, lessen the secretion of this mucous membrane, and as they also hinder digestion by the gastric juice, it is unadvisable, in most cases, to give such substances close to the time of taking food.

Tannin, it has been suggested, may be able by its astringency to set aside slight catarrhal changes of the mucous membrane of the stomach, and has, therefore, been given in one form or other, in some cases of irritative dyspepsia. It has also been given in pyrosis, but, it should be remembered, this symptom may arise from very different pathological states of the stomach, and, consequently, has not always the same significance, as is shown by the fact, that sometimes the ejected fluid is strongly alkaline, and at others equally acid.

Tannin has been recommended in poisoning by the alkaloids, with the view to render the poison less soluble. It thus acts on strychnine and morphia.

Tannin or gallic acid may be used in bleeding from the stomach.

In the intestines, this group act as in the stomach, and so check the secretion of this part, and probably also peristaltic contraction. Their effect, therefore, on the bowels, is a binding one, and preparations containing tannin are very useful in many forms of diarrhœa, both of an acute and chronic kind.

Catechu, kino, red gum, rhatany, hæmatoxylum, are employed in such complaints with great advantage.

For the same purpose, they may be employed as injections into the rectum, and, applied in this way, they are useful to destroy thread worms, and also to bind up the tissues of this part when they are lax and permit of prolapsus ani.

Few applications are so useful to irritable piles as an ointment

of gallic acid, or tannin, with opium. Such an application very generally at once relieves pain, and after a time diminishes the size and irritation of the hæmorrhoidal tumours.

The members of this group have a low diffusion power, and must, in consequence, pass with slowness from the intestines to the blood.

After, if not before, their absorption into the circulation, they must be neutralized with albumen, and for this reason it has been maintained by some authorities that tannin and its allies cannot act as astringents to the parts of the body remote from the intestines.

Nevertheless, these substances are continually given, that they may influence the tissues situated at a distance from the intestines, and apparently with considerable benefit. They are given to check bleeding from the lungs, uterus, and kidneys, to check profuse formation of pus from the bronchial tubes, and the too abundant secretion of milk, and profuse sweating. When used for any of these purposes, pure tannin or gallic acid is employed, and not one of the substances containing these ingredients.

Tannin has also been used to check the loss of albumen from the kidneys in chronic Bright's disease. Its power to accomplish this object has been experimentally tested by George Lewald. He found in a few, but carefully conducted experiments, the albumen to be lessened to an inconsiderable amount by the tannin. This result was a constant one. The diminution in the albumen for twenty-four hours amounted, on an average, to about 0·66 grammes. It was found, moreover, in these cases, the tannin produced a more decided increase in the quantity of the urine.

The glycerine of tannin, as ordered by the Pharmacopœia, may be used with much benefit in the after stages of gonorrhœa, and in gleet. As, however, when used in the above strength, the injection not uncommonly excites much pain, it is desirable to dilute the preparation with an equal quantity of olive oil, or mucilage, and care should be taken that too large a quantity is not injected, or irritation of the neck of the bladder is excited, and, in consequence, there occurs both frequent and painful mic-

turition. Many cases of gleet may be speedily removed by this injection, but, as is the case with all other injections, it not uncommonly happens for the discharge to cease while the application is employed, but to return on its discontinuance. Tannin, in solution alone, or combined with other substances, is very efficient in checking a leucorrhœal discharge. Where this disease proves obstinate, and is accompanied by ulceration of the os uteri, a bolus made of tannin and cocoa-nut fat, applied to the mouth of the uterus is very generally useful.

Glycerine of tannin can check the great discharge, and remove the offensive smell of cancer of the uterus. It may be profitably mixed with some glycerine of carbolic acid.

The effect of the members of this group on the natural constituents of the urine is quite unknown.

Gallic acid "passes unchanged into the urine." It has been detected "in one hour after being taken."

Tannic acid "passes off by the urine in the forms of gallic and pyrogallic acids, and perhaps of a saccharine body." (Parkes.)

TAR.
CREASOTE.
CARBOLIC ACID.
PETROLEUM.
OIL OF TAR.

Creasote and carbolic acid act rather energetically on the skin, and colour it white. In a few days desquamation occurs, and, if the application be continued, pretty active inflammation may be excited. These substances have also the power to coagulate albumen, and, as they act as stimulants and astringents, they may be employed to check bleeding; but we shall speak more fully of the employment of carbolic acid for these purposes in another part of this article.

As a stimulant, creasote may be applied to indolent ulcers, and, from its antiseptic powers, it at the same time removes the

fetor from the sore, if there should be any. On account of these properties, creasote, and especially carbolic acid, may be applied to gangrenous and offensive smelling wounds, both to promote a healthier action in the tissues and to preserve the air of the apartment in a pure and wholesome state.

By Professor Lister carbolic acid has been of late largely used in the treatment of different kinds of wounds. By his treatment he claims to prevent inflammation and suppuration, and so to preserve the patient from the exhausting effects which these produce. The following remarks will explain the action of his treatment:—When blood is effused into healthy tissues it excites no inflammation, suppuration, or fever, but is generally in a variable time absorbed. If, however, the skin be broken, and the wound communicate with the air, the effused blood quickly decomposes, and then excites both inflammation and suppuration. This putrefaction Lister is of opinion is not excited by the air, but by the organic germs which float in it, and if the air which reaches the wound can be freed of these, then neither putrefaction of the blood, nor the consequent inflammation and suppuration can occur. The same authority has made experiments which show that if these germs be prevented reaching a wound its granulations and walls will not form pus, but only a little serum will ooze from its surface.

Carbolic acid can perform what he requires, for it can completely destroy the organic germs floating in the air, and he proposes in his method to filter the air before it reaches the wound, through dressings which contain sufficient carbolic acid to destroy its sceptic germs.

The following is an outline of his method of treatment, which necessarily differs somewhat, according to the nature of the wound, and other circumstances. Contused wounds will be first spoken of.

Of these he says, "All the local inflammatory mischief and general febrile disturbance which follow severe injuries are due to the irritating and poisoning influence of decomposing blood or sloughs. For these evils are entirely avoided by the antiseptic treatment, so that limbs which otherwise would unhesitatingly

be condemned to amputation may be retained, with confidence of the best results."

To destroy septic germs, already in contact with the exposed tissues of the wound, he introduces into all parts of it a solution of carbolic acid. He at first employed pure carbolic acid, but subsequent experience has shown him that a solution containing one-twentieth or one-fortieth of the acid is sufficient to accomplish what he desires. To prevent the subsequent access of germs to the wound, this must be kept constantly covered by dressings containing carbolic acid, which can be accomplished in the following way:—A piece of linen, or lint, is soaked in a solution of carbolic acid in olive oil, and this is to be applied over the wound, and its edges strapped down to prevent the air reaching the wound without first passing through the texture of the dressing. By this means the air is freed of all septic germs before it reaches the wound. Over the lint is to be placed a plaster, whose composition will be immediately given. This dressing must be renewed each day. On removing the old, and replacing it by the new dressing, the greatest care must be taken to prevent air which has not passed through the antiseptic covering reaching the wound. To accomplish this, it is necessary as the old lint is stripped off, at the same time to apply the new. It is impossible to be too careful in this matter, for if any septic germs reach the wound, the efficacy of this treatment is at once and permanently destroyed. Professor Lister first used a solution of carbolic acid in oil, in the proportion of one of the former to four of the latter; but he now employs a weaker preparation.

The plaster with which the dressing is covered is thus prepared at University College, and is a slight modification of the plan recommended by Lister. For the following account the author is indebted to Mr. Martindale, of University College Hospital:—

"Take of shellac	2 parts
Crystallised carbolic acid	1 part.

Heat the lac with one-third of the acid until liquefied, then add the remainder of the acid, and mix thoroughly. Strain, and

spread on calico to the thickness of one-fiftieth of an inch. Make a solution of gutta-percha in bisulphide of carbon (1 part in 30), and filter, with which brush over the surface of the plaster. This covers it with a very thin coating of gutta-percha, destroys its adhesiveness, and allows of its complete removal at each dressing.

"Adhesive plaster, containing 1 per cent. of carbolic acid, is employed to strap the margin of the plaster when applied to the surrounding healthy parts."

The incised wounds of operations may be treated in identically the same way. The surface, after the operation, is to be washed out with the carbolic acid solution, by which not only are any septic germs in contact with the wound destroyed, but bleeding from the smaller vessels is at the same time checked. When this treatment is used in operations, the ligatures may be cut short and left in the wound, or what is better the arteries may be closed by torsion.

Lister further advises abscesses to be treated by a modification of the above plan. He directs the incision to be made under a piece of rag dipped into the solution of carbolic acid and oil, the pus is then to be thoroughly squeezed out of the abscess, but the rag covering the wound must not be removed. The further dressing is to be conducted as with an incised or contused wound. If the discharge from the abscess be very great, the dressing, while this continues, must be changed every twelve hours.

By this treatment, Lister says—and the author's experience fully bears him out—suppuration in the cavity is in most instances prevented, as the old stimulus is removed and the new one of decomposing matter is prevented. Even large abscesses treated in this way may form no new matter, and only a little serum oozes from the wound. Such a favourable termination is indeed the rule with small abscesses, and with large and even enormous ones but little fresh matter is formed, and thus the patient is preserved from the exhausting effects of an abundant and prolonged discharge. So striking are the good effects of this treatment, that often the discharge ceases to be puriform in twenty-four hours, and the edges of the abscess quickly unite and heal. The dressings must be continued till the wound has quite united, and on

no account must the lint be raised to permit of an inspection of the wound, as such curiosity will most certainly ensure the complete failure of the treatment.

It is scarcely possible to speak too highly of this treatment of abscesses, and even those of large size, and when due to diseased bone, as psoas or iliac abscesses, may be admirably treated in this way.

Professor Lister says it is of no consequence whether the opening into the abscess is dependent or not, as the contracting pyogenic membrane soon obliterates the cavity. It may not be out of place to again state that the success of this treatment depends entirely on the care taken to carry out the directions given by Lister, in order to prevent the passage of any septic germs into the wound.

Both carbolic acid and tar may be most profitably employed in the treatment of some stages of eczema and psoriasis.

Tar ointment may be used to eczema in its middle and later stages, when all inflammation has subsided. It is especially useful after the sore is healed, and only a little redness, itching, and some desquamation remain. Sometimes pure tar succeeds better than its ointment, but it must not be employed if there be any inflammation, or if the surface be raw and weeps, otherwise great pain and much inflammation will be excited. Local forms of eczema, as that met with on the back of the hands, may in some instances be much improved by the application of undiluted petroleum, but as this application is generally very painful other and milder remedies should be first tried.

Carbolic acid ointment, composed of ten minims of the acid to an ounce of lard, is useful in the weeping stage of eczema, if the inflammation be not too high, when it moderates the disease, and generally eases the tingling and itching which may be present. It is useful in the eczema of the head of children.

Psoriasis may be most admirably treated by the external application of these remedies. Tar, or its ointment, seldom fail to do much good in such cases. The pure undiluted tar painted over the patches of the eruption, and allowed to remain till it wears gradually away, will in many instances be sufficient to

cure temporarily or permanently some of the most obstinate forms of this disease. Its disagreeable smell and unsightly colour are strong objections to its use. These can be removed and the efficacy of the application be retained by using the creasote ointment recommended by Mr. Squire. It is composed of two or three parts of creasote to one part of white wax. This ointment is a powerful one, and must be applied only to the patch of psoriasis, and not on the neighbouring healthy skin, or this is blistered, an effect which does not occur in the patch of psoriasis itself.

Petroleum soap may be used with advantage in both chronic eczema and psoriasis. As there are soaps of different strengths, if one proves too strong and irritates the skin, a milder one may be substituted for it.

Carbolic acid soap may be used in similar cases. This soap is of great value to medical men, especially accoucheurs and surgeons for their own use, as by washing their hands with it, they can free them from any infectious or noxious matters, and so considerably add to the safety of the patients on whom they operate.

A weak solution of carbolic acid is a very useful injection or wash for large abscesses when these have discharged themselves, or for the chest in empyema, after the pus has been evacuated either naturally or by an operation. Such an injection may also be used to correct the fetor from cancer of the womb, or when this organ from other causes produces an offensive-smelling discharge.

Carbolic acid has been employed as an injection in ozæna, and is stated to remove the smell and lessen the quantity of the discharge.

The following mixture administered by the spray-producer has been recommended:—

Tincture of iodine, ʒj.
Carbolic acid, m. vj.
Water, ʒvj.

This application is without colour.

Creasote may be inhaled with the assistance of steam, and proves useful in bronchitis, lessening in some cases the expectoration,

if this is abundant, and very generally removing the fetor of the breath, when this depends on simple bronchitis, and sometimes even when due to gangrene of the lung.

Creasote mixed either with tannin or opium may be introduced into the hollow of a decayed and painful tooth to bring ease to the patient, and often proves successful.

A gargle or wash of creasote may be used with great advantage in sloughs of the mouth or throat, as they remove the offensive smell which such sores produce, and so improve the general health of the patient, and at the same time produce in the sore a healthier action.

In the stomach small doses of creasote call forth no particular symptoms, but after large quantities there is experienced a feeling of burning at the epigastrium, accompanied by nausea and vomiting.

Creasote does not appear to suffer any change in its composition during its transit through the intestines, as its characteristic smell may, after its employment, be detected in every part of the canal. Creasote finds frequent employment to check vomiting of different diseases, such as of pregnancy, sea-sickness, of cancer, of ulcer of stomach, of Bright's disease, &c. Not unfrequently doses of one to five minims are given, and if such quantities should be desired, it can be conveniently made into a pill with chalk. But the author believes that the failure of the remedy to check nausea and retching in many cases is owing to the largeness of the dose that is given, and which often itself produces these symptoms, if administered in such large quantities. The best effects are obtained, if just sufficient creasote is added to water to make it taste distinctly but not strongly of the medicine, and of this a dessert spoonful may be taken frequently.

When thus employed, this remedy will often prove effectual in staying nausea and retching, but is considered by some persons to have less power over actual vomiting.

Creasote has been given in cholera and typhus fever, but apparently without much benefit.

Creasote passes into the blood, but in too dilute a form to

coagulate the albumen of this fluid. After its administration, it can be detected by its smell in most of the organs, and thus probably it remains entirely, or in chief part unaltered in the blood.

Tar, creasote, and carbolic acid, have been given in bronchitis to influence the mucous membrane of the bronchial tract, and also in phthisis to check both the quantity of the expectoration and its smell when this is offensive.

In gangrene of the lungs, with some authorities it enjoys much favour both for its action on the lungs, and its power to remove the distressingly offensive odour from this disease.

Both tar and creasote are often given in chronic skin diseases, and have further had diuretic properties ascribed to them. Possibly they may exert some topical influence on the mucous membrane of the bladder, for some of the ingredients of tar pass off by the urine influencing both the odour and colour of this excretion.

In health the urine contains a trace of carbolic acid.

Creasote and carbolic acid have been used as injections in gonorrhœa and gleet.

After the administration of carbolic acid, much of this reappears in the urine, which it preserves from decomposition, and hence will, like the sulphites, probably be useful in checking the decomposition of the urine in the bladder, as occurs in cystitis, or when from an enlarged prostate the bladder cannot be completely emptied.

Carbolic acid is useful in removing the smells of drains, water-closets, dissecting-rooms, and hospital wards, &c., and as it is volatile, it penetrates every corner of the room, and is thus an efficient deodorizer.

MUSK.
CASTOREUM.

These are medicines now but little used, although both of them, but especially musk, were highly esteemed by Graves and Cullen.

They possess a peculiar and characteristic smell, which is very oppressive to some people, and occasions in them headache, giddiness, and even fainting. To all persons the smell of musk is rather oppressive and sickening, especially if too strong, thus it differs from some scents which are stimulating and exhilarating, and hence musk is ill-adapted for the sick room, and other scents should be employed if they are desired by convalescents.

In the mouth these substances have a bitter taste.

After the employment of musk in doses of two to five grains, there is observed, in the healthy, weight at the stomach, eructations, dryness of the œsophagus, heaviness of the head, giddiness, and headache, and afterwards, sleepiness, faintness, and a feeling of heaviness in the whole body. After very large doses, there occurred trembling of the limbs, and even convulsions. The pulse was increased in frequency, and was made a little fuller. Such were the symptoms observed by Jörg, but Trousseau and Pidoux failed to obtain many of them, and only noticed headache, with giddiness, while with them the pulse was neither strengthened nor quickened.

These remedies are employed to remove many of those anomalous but distressing symptoms grouped under the name hysteria, and also in melancholia. They have been given in chorea and epilepsy, whooping-cough, nervous palpitation of the heart, cramps of different parts of the body, and even in tetanus.

Dr. Graves obtained much assistance from musk in the treatment of typhus and other fevers when the body was much prostrated and the pulse was weak and feeble.

ALCOHOL.

For many reasons alcohol might with convenience be grouped with chloroform and ether, as there is much similarity in the action of these three medicines. They each, at first, produce much excitement, with increased strength of the pulse, and after

a time this stage gives way to one of unconsciousness, which may be profound. But with this general similarity there occurs the following important difference between alcohol, on the one hand, and chloroform and ether on the other. With the latter two drugs the stage of excitement is short, and soon passes into that of insensibility, which may be continued for a long time without danger to life. But with alcohol the early stage of excitement and intoxication is of considerable duration, and insensibility and unconsciousness are not reached until very large quantities have been taken, and till some time has passed. When this stage of insensibility is obtained the danger of death is imminent from paralysis of the heart and of the movements of respiration.

From this difference it will be easily understood that while chloroform and ether are used as anæsthetics, alcohol never finds employment for this purpose, but is of service only in its early and stimulating stage.

As is the case with the two drugs with which it has now been brought in comparison, alcohol is very volatile, and has a high diffusion power, which properties must play a part in determining its influence on the body.

External Application.—From its volatility, it is sometimes employed to abstract heat, and cool the surface of the body, as the head, in inflammation of the brain, &c. It is not a very effectual refrigerator, and, when such a remedy is required, ice is very much to be preferred.

From its tolerably high diffusion power, it penetrates the skin if its evaporation is prevented, and excites the living tissues beneath the cuticle, causing a feeling of heat and some inflammation. It may thus be employed as a counter-irritant.

It coagulates albumen, and is sometimes used to form over sores a thin protective layer, which excludes the air, and so promotes their healing. As brandy, or eau de Cologne, alcohol is often applied to the skin of parts exposed to pressure, to harden them, and prevent the occurrence of bed-sores.* This is a most

* To prevent these, it is a still better practice to paint the skin of prominent parts exposed to pressure, as soon as any redness is seen, with a pretty strong solution of nitrate of silver in nitrous ether.

excellent practice, and should be adopted before the skin is abraded, and when, or even before, any redness is present.

It is a useful practice to bathe the nipple of a suckling woman with brandy each time it is used, and then carefully to wash the part, and wipe it dry. The application of the brandy may profitably be applied some days before delivery. By this treatment the tissues of the nipple are hardened, and there is prevented the formation of those cracked nipples which are accompanied by so much distress and pain.

In the mouth, it possesses an agreeable and warm taste. Probably in virtue of its power to coagulate albumen, and perhaps of other properties, it constringes to a small extent the mucous membrane of the mouth, and is sometimes used, diluted with water, as an astringent gargle in relaxed throat, scurvy, salivation, &c.

In the stomach it exerts a double action. Thus, it may affect the gastric juice, and also the secreting mucous membrane. Its action on these will be considered separately. If the quantity of alcohol be small, its effects on the pepsin of the gastric juice is insignificant; but when large quantities are taken, the pepsin is destroyed, and loses its power to dissolve food.

As with the gastric juice, so with the mucous membrane, the effect of alcohol differs, whether large or small quantities are taken. In moderate doses it has been experimentally proved to increase the secretion of the gastric juice, and every-day experience confirms this fact. After large quantities, the stomach is upset, its mucous coat inflamed, and this is covered with a thick tenacious mucus, and loses its power to secrete.

By this influence on the functions of the stomach, alcohol, as it may be easily understood, is very useful in disease, as under the following circumstances:—

It not uncommonly happens for persons when much fatigued to lose all appetite and power to digest, who, if they eat food, suffer from this laying undigested on the stomach. Such people may have their appetite and digestion restored to them by the aid of a glass of wine, or a little brandy and water, taken shortly before food is eaten.

And, again, with convalescents from acute diseases, the powers of the body may remain a long time depressed, and, among others, the digestion may remain weak. Such persons again receive great assistance from the use of alcoholic stimulants just before or at meal times.

Another class of persons may be benefited in the same way, namely, those who live in towns, and lead a sedentary life; for in such digestion is often very weak, and food can only be properly digested in sufficient quantity by the help of wine or spirits.

With no persons are stimulants so valuable as those prostrate with acute illness. Then digestion, in common with the other functions, is much depressed, while it is of all things important to support the strength, as if life can be prolonged for a sufficient time the fever will cease, and leave the patient in comparative safety. The strength can best be supported by food; but this, it has been seen, can be but sparingly digested by the weakened stomach. In such critical circumstances, digestion may be aided by the use of alcohol. It is obvious when given to such persons to assist digestion, the stimulant should be given with small quantities of food, and it is important to insist on this point, as it is common with both medical men and the laity to trust to the alcohol alone, and to forget that while capable of doing good by stimulating the heart, it is also very effectual by the power it possesses to increase digestion, and is then the means of supporting the patient in the best and most natural manner.

To persons very prostrate, and in whom, consequently, digestion is very weak, food and stimulants mixed together should be given in small quantities, and these be frequently repeated. To those who are stronger, it is better for the food to be eaten as near the ordinary meal time as possible, as from habit the stomach is at such a time better prepared for digestion.

It has been mentioned that large quantities of alcohol excite catarrh of the stomach; but it is singular what an amount can be taken by persons prostrated with fever, without any such affection being excited. The same fact is also noticed in convalescence from exhausting diseases. Still, some care must be exercised in the administration of stimulants to such patients, as

it sometimes happens by their too free employment the stomach is upset, and vomiting of everything which is eaten occurs, a circumstance which very greatly adds to the dangers of the patient.

By the prolonged indulgence in alcoholic drinks, the stomach becomes after a variable time very seriously damaged from the chronic catarrh which is excited. The mucous membrane is coated with tenacious mucus, that excites unhealthy fermentation in the food, and the structure of this membrane is also considerably altered, for there occurs a great increase of the connective tissue, which, by its contraction, obstructs and destroys the secreting follicles and their lining cells. The mucous membrane thus becomes thickened, hardened, and uneven; and in its substance, from obliteration of the orifices of follicles, while the part beneath them remains undestroyed, cysts are formed, which enlarge from the accumulation of cells within them.

In consequence of these serious changes very little gastric juice is poured out in response to the demand made by the food, while in this, by the mucus coating of the stomach, unhealthy fermentations are excited, and hence there is produced much gas, with various acids, such as butyric, acetic, &c., which produce acidity and heartburn.

Morning vomiting of a scanty, sour, bitter, and tenacious fluid is a characteristic symptom of this disease.

From its high diffusion power, alcohol passes with readiness into the blood, and but little can reach far into the intestines. Spirits, and especially brandy, are often employed with success to control the after stages of acute simple diarrhœa, when the irritant which excited it has been removed, and when, from the relaxed condition of the mucous membrane, the liquid parts of the blood pass into the intestines, and so produce frequent and watery stools.

Even in large quantities it appears to exercise no influence, either good or bad, on the conversion of starch into sugar.

As we have said, alcohol passes readily into the blood, and its effects on this fluid, and the tissues to which it is conveyed, will next be considered.

From careful experiments, performed by several observers, it appears both the carbonic acid separated by the lungs and the urea by the kidneys are considerably diminished while alcohol is taken. This must show lessened destruction, and therefore lessened oxidation of the tissues. This fact of lessened oxidation is shown in other ways; for by large quantities of alcohol the temperature of the body may be considerably reduced; and, further, Dr. G. Harley states, as the results of his experiments, that blood withdrawn from the vessels, and to which alcohol is added in small quantities, absorbs less oxygen from the surrounding air, and in its turn gives off less carbonic acid than when no alcohol is added. These last-mentioned observations, perhaps, require to be repeated, with the exclusion of some sources of fallacy; but still they add something to the evidence, showing the power of alcohol to lessen the oxidation of the animal tissues.

From this property to lessen the destruction of the tissues, by diminishing oxidation, it has been concluded alcohol is protective of the tissues, and may thus be economically used. But as far as our present knowledge of this subject can guide us, it would appear, while alcohol can thus protect the tissues from oxidation and destruction, it can only do so at the expense of the different powers of the body. The grounds for this conclusion will appear in the following remarks:—

It is now admitted, the vital forces of the body, as muscular force, nerve force, are correlated to the physical forces, as heat, electricity, chemical affinity, &c., and that these latter may be converted into the former by the agency of the organs of the body. Force, as chemical affinity, is conveyed into the body in the food we eat, and, by oxidation, is set free and put at the disposal of the muscles, brain, nerves, &c., and by them changed into the forces peculiar to the animal organism.

Such being the case, if by any means we lessen oxidation, we must, in a corresponding degree, diminish the amount of force put at the disposal of the organs of the body, and must, therefore, in an equal degree, diminish the functions of the body.

Alcohol, therefore, if these speculations are correct, while pro-

tecting the tissues from destruction, must, in an equal degree, diminish some or all of the functions of the body.

It may be said there occurs an excess of oxidation over and above what is required to supply forces to the body, and this displays itself in heat which is got rid of by evaporation and radiation, and that it is this excess of oxidation which alcohol checks.

The value of alcohol as a food will next be considered. It can be easily conceived that alcohol may be oxidized and destroyed in the body like ordinary food, and, in its destruction yield up force to be applied by the tissues. If this occurs, then alcohol may be considered as food. That such combustion occurs, was, a few years ago, denied by several authorities, who founded their denial on experiments performed by them. They asserted, the chief part, if not all, the alcohol taken into the system, is again separated from it, unchanged, either by the urine, breath, or perspiration. Recent investigations have made these assertions doubtful, and at present the question of the degree of destruction of alcohol in the body must be considered as unsettled. But, granting alcohol can be consumed, and so act as a food, it would not appear from the preceding remarks that it is a good and useful food in health, for, by diminishing combustion, alcohol lessens the amount of force which can be appropriated and displayed by the body, even though it is itself consumed.

From what has preceded, it is evident alcohol is not a necessary or even a useful article of diet for the healthy, an assertion proved by varied and repeated experience, as it has always been found by army medical men, that fatigue can be better endured by the troops, and also the extremes of climate better borne, if alcohol be altogether abstained from.

The experience of the celebrated Moscow campaign was of the same kind.

It has always been found, that during arduous marches, if water alone is taken, the health of the men is exceptionally good, but, as soon as spirits are allowed disease breaks out.

Trainers have long recognized the fact, that the power of sustained exertion and to resist fatigue, is greatest when alcohol is

abstained from, and it has been adopted by them in preparing athletes for the ring or race. And it may be further added, the ill health of this class of people depends not on the rigour of the system to which they are subjected, but on the excesses they indulge in when the period of their training is completed.

There can be no doubt alcohol is not required by the healthy, who are capable of the fullest amount of mental and physical exertion without it, nay, they are better without it.

It must, however, be recollected these remarks apply to pure alcoholic drinks as spirits, and not to beers, and wines which contain, in different quantities, ingredients highly useful as food, while the amount of alcohol in the lighter beers and wines is small, and cannot be prejudicial to the robust, and may be highly serviceable to those whose health is below par, for such may have their flagging functions braced up and improved by a little alcoholic stimulant. They are useful, therefore, to town-living people, and especially to those who pass much of their time indoors, perhaps in an unhealthy atmosphere, and who cannot properly digest their food unless they take some stimulant.

Whatever doubts there may be concerning the usefulness of alcohol in moderate quantities, there is no question of its poisonous and pernicious effects if drank in excess. All parts of the body then are injured and degenerated, and in consequence there is produced premature old age. The lungs are prone to emphysema, there is loss of both physical and mental vigour; the kidneys, liver, and stomach, may become cirrhosed, and these diseases produce their customary symptoms. Even when the effects of hard drinking are not very apparent in health, they are displayed on the occurrence of any illness or accident, when the constitution is found by the indulgence to be greatly weakened, and the power to resist disease considerably impaired. Drunkards thus succumb to an accident or illness which other and healthier men would easily overcome.

It hence appears that alcohol, when drunk in excess, is prejudicial in two ways; by lessening oxidation it diminishes the supply of force to the body, and by producing disease of the organs it impairs their power to appropriate the forces put at their disposal.

It may be here conveniently noted that habit appears to modify the power of alcohol to check oxidation. At least, those who drink to excess do not even with enormous doses of brandy or pure alcohol experience any diminution in the temperature of their bodies.

The effects of alcohol on the different functions of the body will next be spoken of in greater detail.

The influence of alcoholic stimulants on the heart is the most noteworthy. By them the contractions of this organ are strengthened, and this effect is especially observed when from any cause the heart is weakened. This effect of alcohol is well seen in debilitating diseases, which are always attended by a quickened and weakened pulse. Alcohol, by its tonic influence on the heart, strengthens the pulse, and reduces its frequency. It must be considered one of the most powerful tonics of the heart, and in this property, together with its power to promote digestion by increasing the gastric juice, is afforded an explanation of the very great usefulness of this liquid in those diseases, both acute and chronic, which weaken the powers of the body. These remarks lead to the consideration of alcohol as a remedy in disease.

In most diseases when accompanied by weakness or prostration, alcohol in one or other of its forms, will be found perhaps the most valuable medicine. In acute diseases it is of especial and most conspicuous service, as such run a limited and very definite course, and if life can be maintained sufficiently long they must cease, when the danger will be almost at an end.

In such cases, indeed, it is a question of time, and alcohol by its action on the stomach and heart, and perhaps in other ways also, often supports life till the disease ceases, and the patient passes into convalescence and into greater safety. At other times, when the heart is suddenly enfeebled, as from fright, loss of blood, accidents, or other causes, it is best strengthened by brandy or wine.

All diseases, therefore, accompanied by weakness, and especially if the heart is weakened out of proportion to the rest of the system, are to be treated by this remedy. Yet certain precautions must be observed in its administration, and its effects on

the different functions must be carefully watched to learn whether we obtain from the employment of the alcohol good or harm, and although the pulse and heart afford the greatest and most reliable information on this point, yet the influence of the alcohol on the other organs must not be overlooked, as it may happen that while one system is benefited others are injured, and with some good the alcohol on the whole does much harm.

The following excellent rules, regarding the use of stimulants in fever, were laid down by Dr. Armstrong, and have been endorsed by Dr. Graves:—

During the administration of alcohol—

1. If the tongue become more dry and baked they generally do harm. If it become moist they do good.
2. If the pulse become quicker they do harm. If it become slower they do good.
3. If the skin become hot and parched they do harm. If it become more comfortably moist they do good.
4. If the breathing become more hurried they do harm. If it become more and more tranquil they do good.

In judging of the influence of the alcohol on the pulse, its compressibility is of more importance than its volume. Under the action of alcohol, a soft and yielding pulse of large volume often becomes much less compressible and smaller, changes which show an increase in the tonicity of the arteries, and in the strength of the heart.

Such are the rules which must guide us in the employment of this remedy in fevers and in other diseases, and they also give us information as to the quantity which should be administered, for while the good effects above enumerated are obtained, the quantity of alcohol may be continued or even increased.

There are other circumstances which afford us information, in respect of the employment of alcoholic drinks, and they are these:—At the two extremes of age the powers of the body are easily depressed, and hence, with such persons, stimulants are early called for, and must be freely used. In such, and especially the

aged, it is of the greatest importance to anticipate prostration by the early employment of alcohol, as when once this occurs the greatest difficulty is experienced in restoring the patient to his former state. Young children, when weak, take stimulants even in large quantities with benefit. Thus, age may afford intimation of the want of stimulants. Next, the knowledge of the course a disease usually runs may give information in respect of this question. Some acute diseases, such as typhus, are very liable to produce much depression, especially at the extremes of life, and hence stimulants should in such cases be early employed.

The question, regarding the quantity of alcohol which should be given in any particular case, is best answered by a reference to the valuable directions laid down by Armstrong.

The kind of alcoholic stimulant employed is not a matter of great importance, provided it is good and sound in quality. It is undesirable to give several kinds of stimulants at about the same time, or the stomach may be deranged, but they may be changed from time to time according to the desire of the patient. To persons who are very weak the stimulant must not be given in large quantities at distant periods of the day, as far greater advantage will be obtained by dividing the dose, and administering the stimulant very frequently.

By the former plan, the heart is at one time strongly stimulated, and then, as the alcohol is decomposed or eliminated, it is left unsustained, when great weakness may occur; while, by frequent administration of smaller quantities, it is kept more uniformly supported.

From what has been stated it will be gathered, that with the stimulant some easily digested food in small quantities should be given. For alcohol promotes digestion, and thus, in the most natural and most effectual way, supports the strength of the patient.

In common with ether and chloroform alcohol is an antispasmodic, and may be employed in the same cases and in the same manner. Ether and chloroform are generally considered superior to it as antispasmodics.

MANCHESTER ROYAL INFIRMARY

It not unusually happens for one alcoholic stimulant to do harm, while another is found useful. This difference is especially noticed in many coughs which may be made much worse by porter or beer, but be unaffected or even lessened by brandy or wine. With many persons beer or stout produce much sleepiness, heaviness, even headache, and flushing of the face, while the same people may take wine or brandy without any of these inconveniences. It may also be here remarked, individual peculiarities in respect of the effect of wines is sometimes met with, as there are persons who cannot take sherry without suffering from acidity, and others who are speedily troubled with gouty pains if they take port.

In sickness, the wish of the patient for any particular form of stimulant is often a correct indication of its desirability, and while on this subject, it may be stated that fever patients, when very thirsty, may have this, in some instances, very gratefully satiated by drinking freely of the weaker beers. It allays their thirst, and also conveys alcohol into the system.

It is a question of much importance and one which promises soon to be settled, how far alcohol is consumed in the body: whether the greater part is eliminated by the lungs, kidneys, and skin, or whether it is oxidized, and made to serve the purposes of the economy.

A short time ago it was very generally accepted that the chief part, if not the whole of the alcohol is separated undestroyed. More recent observations appear to discountenance this assertion, and to establish that most of it is consumed.

It has been mentioned that alcohol can reduce the heat of the body, but only in a very unimportant degree, if a usual quantity only be taken. After a poisonous dose the depression is much greater and may amount to 2° or even 3° Fah. If, therefore, alcohol can reduce the heat of the healthy body, it might be thought that in it we possess a valuable remedy in fevers as a febrifuge. Alcohol does in some measure reduce the preternatural heat of fevers; but its power in this respect is very small, and such enormous doses must be taken to produce even trifling results, that by alcohol we shall do more harm in some ways than good by reduction of the temperature.

The author has made many observations on this point, and is convinced that little can be hoped for from alcohol as a means of diminishing the preternatural heat of fever patients. Care must be exercised in the employment of alcohol in diabetes. Such drinks generally increase the sugar of the urine, and if any such beverage is required, one free from sugar or dextrine must be chosen.

Elimination.—That part of the alcohol which is eliminated passes out of the body by the lungs, the skin, and the kidneys.

That some is separated by the breath is apparent from the smell it acquires after ardent spirits have been drunk. The odour of the breath of those who drink in excess is peculiar and quite unlike the smell of any alcoholic drinks, a fact which perhaps shows alcohol is in part decomposed in the body. Some is separated by the skin, and alcohol, in the form of grog, taken warm, shortly before bed-time, is reputed to be diaphoretic. But the perspiration is probably due to the warm water and not to the alcohol mixed with it.

Alcohol exercises a very decided influence on the constitution of the urine, for by it the urea is lessened, often very considerably so, and as there is no subsequent increased elimination, it causes, not retention of urea in the blood, but diminishes the formation of it. The pigments, phosphoric acid, sulphuric acid, are also lessened, so also is the chlorine, but this latter is, by the alcohol, merely temporarily retained in the system.

Such is the influence of pure alcohol on the urine, and consequently, of such drinks as brandy, rum, whisky, gin, &c., but wines and beers, from the other ingredients besides the alcohol, as acids, salts, &c., have a somewhat different effect on this fluid, for by such drinks the urea is actually increased. Beers, like wines, from the sugar, gum, acids, salts, &c., they contain, are really nutritious.

CHLOROFORM.

Chloroform, from its volatility, when applied to the surface of the body, speedily evaporates and cools the skin. For this

purpose it is seldom used, being inferior as a refrigerator to either ether or alcohol.

Its high diffusion power enables it to penetrate with readiness the animal textures, and from this property when applied to the skin, if evaporation be prevented, it penetrates the cuticle, and, irritating the softer and living tissues beneath, excites in them a variable amount of inflammation. Chloroform is thus a rubefacient.

When employed in quantities insufficient to excite inflammation, chloroform deadens feeling in the nerves, and acts as a local anæsthetic, and for this purpose is sometimes applied to relieve pain, and occasionally with good effect, although it often fails, and is inferior for this purpose to many other external applications.

It has been used in the different neuralgias, and sometimes with success, but, in the author's opinion, it most frequently fails, and, even when successful, the relief it brings is generally very temporary, and the pain soon returns.

In faceache or toothache, two or three drops on a small piece of cotton wool, may be introduced into the ear. Occasionally, the most complete and permanent relief follows; but, if too large a quantity be used, it will excite inflammation, which may proceed to vesication, and give much trouble and annoyance to the patient. The pain of cancer, when the skin is broken, and a painful, irritable sore is left, may be much relieved by playing on the raw surface with some vapour of chloroform. The freedom from pain it produces, lasts often for several hours, and ease can be again brought to the patient by a renewal of this application. The pain of cancer of the uterus, of ulceration of the os uteri, of neuralgia of the uterus, and, in a less degree, the annoyance of pruritus pudendi, can be relieved by a similar proceeding. The vapour must, by a suitable instrument, be made to play on the os uteri for some minutes. This application of chloroform is often followed by the happiest results in cancer of the uterus. The same application may, the author thinks, be tried in cancer of the rectum, spasms of the intestines, &c. It should, however, be recollected, that chloroform is easily absorbed by the large intestine.

The author has tried the power of chloroform liniment and ointment to destroy lice, but he found them much less certain and speedy than the mercury ointment; indeed, they seemed to have very little influence over these animals.

This agent is not unfrequently added to ointments compounded to ease the troublesome itching of certain skin diseases, as urticaria, lichen, &c. It is usually mixed with other substances whose power to check or control itching is undoubted, and, consequently, it is difficult to learn of what service chloroform is in this respect. There are so many other applications so sure of success, that we are rarely tempted to try the use of a remedy of whose good effects we feel unsure. (See Mercury, Acids, Alkalies, Cyanide of Potassium, Glycerine of Tannin, Glycerine of Starch, Unguentum Staphisagriæ, Benzoic Acid.)

In the mouth it acts similarly to its external operation, *i.e.*, it excites some feeling of warmth, and if in larger quantities, some inflammation. As a stimulant to the mucous membrane, it excites a flow of saliva. Its only use here is in toothache. It sometimes undoubtedly acts promptly, and its effects are permanent. But discretion must be used in its employment. If the pain is dependent on an inflamed pulp, the plan usually adopted of plugging the cavity with wool moistened with chloroform will be found to aggravate the pain. At first this is removed, but soon the primary anæsthetic effects wear off, and then the pain recurs with greater severity, for the application has excited even greater inflammation than existed before. If chloroform be used in such cases, the best plan is to drop a small quantity on a piece of lint, and to fold this over the hollow tooth. The vapour then comes in contact with the painful pulp, and may permanently free it from pain.

In the stomach it excites a feeling of warmth, and in large doses nausea and vomiting. It is used in flatulent distensions of the stomach, sea sickness, and other vomitings, in which drop doses of pure chloroform will be found of benefit.

By virtue of its high diffusion power it passes rapidly into the blood, and but little, if any, of that administered finds its way far into the intestines. The physical and chemical changes pro-

duced in the blood by its admixture with the chloroform are at present unknown.

In health, when given by the mouth in medicinal doses, it produces very little change in either the frequency or strength of the contractions of the heart. It is said, when inhaled, judging by the hæmadynamometer, at the very first, to slightly increase their force. In disease, on the other hand, when the heart beats feebly, especially if this be produced by some sudden and transient cause, this medicine can certainly remove the enfeeblement of the heart's contractions, and so relieves such symptoms as syncope, &c.; but it is in no way preferable to a glass of brandy and water, or wine. It is reputed to act more quickly and evanescently than alcohol, and its effects on the heart certainly more speedily decline than is the case with alcohol. It is frequently administered to patients who suffer from weakness, with depression of spirits, nervousness, &c., and to those who are hysterical. Its usefulness is often very great, but is soon lost by habit, which is, indeed, the case with all stimulants, but especially so with chloroform (and ether), so that to continue to obtain from it any benefit, the doses must be increased, and even then it soon loses all its virtues.

In diarrhœa, after the irritant which caused it has been removed, chloroform may be given with much benefit, combined with astringents and opium, and then acts as a carminative. It may be very usefully employed in colic of the stomach or intestines, from whatever cause this may arise, and also in renal and biliary colic, in hiccup, hysteria, and asthma (primary and secondary). From the benefit it affords in these affections, it is ranked among the antispasmodics. The method of its action is at present unknown. Possibly it restores to the weakened and depressed muscular or nervous tissues (on which weakness, the spasm of pain depends) their natural physical conditions, and so controls inordinate action in the muscles, and removes pain from the nerves. It would then be a true stimulant. It is usually combined with opium when employed in the treatment of any of the above diseases, and this combination succeeds most admirably in staying these affections, but chief of the effect is due to the

opium, whose action, however, is apparently increased and sustained by the chloroform.

The paroxysmal dyspnœa of primary, and especially of secondary asthma, is often benefited by chloroform taken into the stomach.

It is often of most conspicuous benefit in certain coughs. Here it is best combined with small doses of morphia or opium, and the two given in a drachm dose of glycerine or honey. It is useful when the cough is paroxysmal and violent—violent out of proportion to the amount of expectoration which has to be raised, when, indeed, there appears to be much excitability or irritability in the respiratory organs, and when a slight irritation is followed by a distressing fit of coughing. In such circumstances, the chloroform is of more service than the opium, and the former should be in a full, while the latter should be given in a very small dose. It is thus very useful to allay the cough in the fibroid form of phthisis, when this is, as is frequently the case, paroxysmal, and very wearing and exhausting to the patient. It often happens that cough is owing to a condition of throat, and even when due solely to disease of the lungs, the application of the medicine to the throat and parts about the glottis is often beneficial, in accordance with a general rule that organs can be influenced through the nerves, by remedies applied to the orifices by which they communicate either with the large cavities or surface of the body. Here we have an explanation of the following fact, which is well known, namely, that many coughs may be much more efficiently allayed if the opium and chloroform mixture with glycerine, be swallowed slowly, and be kept retained in the fauces as long as possible.*

* In fibroid phthisis, the long-continued teasing cough requires another explanation, and so a different treatment. In this form of lung disease there is often such extensive induration, with thickening of the pleura, as to prevent any expansion of the lung, and consequently of the chest walls, hence little or no air enters the consolidated part of the lung, and no expulsive force can be brought to bear on the mucus to expel it. In such a case our attention should be given to the checking of the often abundant secretion, or lessening its tenacity, and so facilitating its expulsion.

Being highly volatile, much of this fluid passes off by the lungs, and can be detected by the smell in the breath. Some, probably for the same reason, escapes by the skin, and some probably by the urine. In its passage out by the lungs it probably in no way influences the mucous membrane of the bronchial tubes, as the quantity separated is very small, and even during and after inhalation of chloroform we do not observe any alteration in the secretion of this mucous membrane. Its influence on the kidneys and the urine, if any, is at present unknown.

From Harley's observations on the action of chloroform on the respiratory function of the blood, it may be concluded that there is lessened oxidation of the blood, and less carbonic acid separated when this medicine is used in any way; but his experiments require to be conducted with greater care, and some possible fallacies excluded before they can be explicitly accepted.

It is as an anæsthetic that chloroform is of the most frequent and signal service, and as such, has to the present time held its ground against all competition.

It is proposed to give a succinct and practical account of the administration of chloroform as an anæsthetic.

It very often causes at first a feeling of tingling and heat in the lips and nose, and if these parts are accidentally moistened with the chloroform, inflammation may be produced, sufficient even to form blisters. This may always be prevented by care, and with still greater certainty, if the nose and lips are first smeared with glycerine or cold cream, or such-like protecting substances.

The early sensations experienced vary much in different persons. With some they are sufficiently agreeable to tempt them to inhale this substance merely to obtain these pleasurable sensations; with others—and these are the majority—the feelings produced are more or less disagreeable, and indeed are often greatly so.

There is at first a feeling of warmth at the pit of the stomach, which spreads to the extremities, and is accompanied by some excitement, and there soon follows all, or some of the following sensations.

Noises in the ears, lights before the eyes, a feeling of great

weight and oppression of chest; great beating of the heart, and throbbing in the great vessels, and a sensation as of choking. These may occur without danger, and need excite no apprehension. It not unfrequently happens, that at the very commencement of the administration, some cough is excited, or even a passing spasm of the glottis; these are to be accepted as sure signs that the vapour is being administered in too concentrated a form, and more air must be mixed with it, by opening the valve in Clover's apparatus, or removing the lint to a greater distance from the nose and mouth.

Some trouble may be given, and alarm excited by females at this early stage of the proceedings becoming hysterical. They laugh, sob, or cry—often their breathing is extremely irregular, and made hurried—a circumstance which causes alarm to the friends, and to those inexperienced in the application of chloroform.

This condition soon subsides as the patient passes more deeply under the power of this anæsthetic, and it is to be accepted as an indication to continue the administration, and not to withhold it.

The pulse is at first quick, and it may be weak; this, if not due to the illness under which the patient suffers, is the effect of nervousness and anxiety. As soon, therefore, as unconsciousness is obtained, it falls in frequency, and gains in force.

In a few seconds from the commencement of the administration, all feeling of discomfort ceases, and the patient becomes quiet, and breathes calmly. The consciousness is now more or less affected —questions are still heard, but are slowly answered, and not to the purpose. (This stage is sufficient during delivery, and in the treatment of renal colic.) Soon all knowledge of the external world is lost, and a period of excitement occurs. Various, and very different ideas occupy the mind. Some struggle and wish to get up, and often are much irritated when they are restrained. The stage of complete unconsciousness—the state required for capital operations—is now fast approaching. Before complete unconsciousness and perfect muscular relaxation is obtained, there very frequently happens violent tonic contraction of the muscles of the body.

The extremities become rigid. The muscles of the chest are firmly fixed, and the respiration thus becomes impeded. This, together with the general violent muscular contraction causes very great lividity of the face. The complexion is dusky. The eyes injected and prominent, the lips blue. The jugulars in the neck stand out like large black cords. The mouth is clenched—a profuse perspiration breaks out on the body, especially about the face. In a few seconds this all passes away. These appearances may be accepted as a sure indication of the immediate approach of utter insensibility, and complete flaccidity of the muscles, and therefore the administration must then be conducted with increased caution, or suddenly the patient passes into a stage of danger, with noisy, stertorous, and quick and shallow breathing, and quick, weak pulse.

These violent muscular contractions which greatly distort the face, and frighten the patient's friends, rarely occur in women or children, or in men weak from some exhausting illness. It is more frequently seen when the chloroform is administered too abundantly, and the patient is brought under its influence too quickly.

As has been remarked, as the muscles relax, and these contractions cease, the stage of perfect insensibility is reached. The muscles are now quite flaccid, and reflex action is lost. The conjunctiva can be touched without producing winking. The limbs when raised and let go, fall heavily. The breathing is calm, but a little superficial; the pulse is not much altered, but it may be a little more compressible. The face is moist with perspiration, the pupil is contracted, and its orifice small.

If the chloroform now be continued, the breathing becomes noisy and stertorous; the pupil greatly dilates; the pulse loses its strength, and the breathing becomes gradually more and more shallow, and less and less frequent, till it and the pulse stop. If the chloroform be removed, and artificial respiration be performed, breathing will even now very often recommence, and the pulse is again felt at the wrist, and life is saved. The author has, on several occasions, while administering chloroform, seen persons recover who have been brought to this critical condition.

On the other hand, it appears that sometimes, without warn-

ing, while the pulse is good and the breathing deep and quiet, the heart suddenly stops, and respiration immediately ceases.

This is supposed to be death from cardiac syncope, while in the former case the death is supposed to be due to the gradual paralysis of the muscles of respiration.

In administering chloroform, the attention should be directed to the state of the pulse, the breathing, the conjunctiva, and the pupil. The pulse usually throughout retains its frequency and force. If it becomes quick and weak, or irregular, then the inhalation should be withheld, unless the frequency of the beats can be accounted for by the struggles of the patient. The breathing should be watched, as this often affords an earlier sign of danger than the state of the pulse. If this becomes very shallow, and gradually less frequent, the chloroform administration should be for a time suspended.

The surest signs of safety, and the earliest of danger, are afforded by the state of the conjunctiva and pupil; for while irritation of the conjunctiva causes reflex action, and is followed by winking, there is usually no danger.

Another most important point to look to, is the size of the pupil.

In the stages of insensibility in which no danger is to be apprehended, the pupil is much contracted, and its aperture small; but when danger is approaching from the too far administration of the anæsthetic, the pupil dilates. This is, in the author's opinion, the earliest and most valuable sign of approaching danger. His attention was first directed to this condition of the pupil by his friend Mr. Clover.

It is generally ascertained that the patient is quite insensible, and fit to suffer capital operations, when all reflex action is lost on touching the conjunctiva, and the limbs, when raised, fall heavily.

There are one or two circumstances which may occur, and which require a passing notice. One of them is the occurrence of vomiting. This is very liable to happen if food has been taken a short time before the administration is begun, and occurs as the patient is passing under the influence of the chlo-

roform, and always ceases when the full but safe effects are reached. It is more common for persons to vomit as they are recovering from, than as they are passing under the influence of this drug, and when this happens, after the full effects of chloroform have been obtained, it may be taken as a sign of returning consciousness, and if the operation is not completed, the administration should be at once continued, when the vomiting will speedily cease.

But while chloroform should not be administered soon after a meal, neither should it be given on a prolonged fast, or vomiting will in all probability occur, and also—what is even more to be undesired—much faintness and prostration after recovery from the narcotism of the chloroform, which effects may last all day.

Another circumstance which should be known, and borne in mind, is, that operations on the rectum and vagina often cause, nay, generally cause, even when the patient is quite insensible, noisy catchy breathing, which in sound resembles very much stertorous breathing, and is often mistaken for it, and thought to show that too much chloroform has been administered; but such is not the case. The true state of things can generally be learned by a little attention to the circumstances of the noisy breathing. Thus it does not occur until the parts named are manipulated, and is especially loud and noisy when the finger, or an instrument is passed into the vagina or rectum with any force.

When the administration is discontinued, consciousness usually returns in a few minutes, but is sometimes delayed for a longer period.

If perfect quiet be observed, its effects are often followed by sleep, which refreshes the patient, and gives time for many of the disagreeable consequences of the inhalation to pass off, and allows also the pain of the operation to subside.

To avoid vomiting, it is advisable to direct that no food should be taken for three or four hours before the administration begins. At the same time, too long a previous fast should be avoided, or fainting and much exhaustion from a small loss of blood during the operation, may occur. If vomiting be produced the head should be turned on one side to assist the escape from the mouth

of the rejected food, and to prevent its passing into the larynx, and choking the patient.

With care, insensibility may be maintained for many hours without any danger.

Experiment, experience, and common sense all show the dangers to be in proportion to the percentage of chloroform vapour inhaled in the air. The importance of ascertaining the quantity which shall be sufficient to bring the patient speedily, and safely to insensibility is apparent. This has been shown by Mr. Clover to be in the proportion of 4 to 5 per cent. of chloroform vapour. And it has been found in animals killed by the inhalation of this amount of chloroform, the heart continued to beat long after respiration had stopped.

With this quantity insensibility can be produced in about five minutes, and, at the same time, there is very little danger of the serious evils of an over-dose.

By Mr. Clover the percentage of chloroform vapour first administered is about 2 per cent., and as the patient becomes accustomed to its action, the quantity is increased till 5 per cent. is reached.

From what has just been said, it will be seen that the great requirement in the use of chloroform is some instrument which shall enable us to administer this substance in a known quantity. This, with other necessary conditions, the apparatus contrived by Mr. Clover, fully meets.

The way in which chloroform destroys life is not yet well worked out, and much uncertainty still remains concerning its action on the heart. The following is the sequence of events observed in animals killed by chloroform, when the percentage of its vapour is not sufficiently great to destroy life at once. The breathing grows gradually more and more shallow and infrequent, while the pulse becomes weaker, and this even ceases, and soon after breathing stops, but still, for a short time, the heart continues to beat languidly. This is the course of events which experiment has shown to be the case in animals, and which is also most frequently met with in the human subject. Here it is difficult to say whether the poison acts immediately on

the heart, and whether the cessation of the pulse, and the enfeeblement of the heart-beats is due to this, or whether it is simply connected, and depends on the gradual cessation of the breathing.

Both views are probably correct, and the gradual extinction of the heart's movements is to be explained both by the direct action of the poison on its ganglia and on the arrest of the breathing. That the latter is true admits of no doubt, but a doubt for want of sufficient evidence still remains concerning the former.

It is probable that the heart may be at once and directly poisoned by the chloroform, and be paralysed by it, as, when a very large percentage of the vapour is breathed the heart's movements cease immediately; and further, Dr. Harley has shown that a frog's heart, if suspended in chloroform vapour, ceases to beat very much sooner than one suspended in watery vapour.

The direct action of chloroform on the heart is probably displayed in those cases of death in the human subject, when, without warning, the patient becomes pulseless and breathless, and is at once dead and beyond all hope of recovery.

When danger is apprehended, and any serious symptoms arise, the chloroform administration should, of course, be temporarily discontinued, and artificial respiration, after Sylvester's method, at once applied, whether the breathing has ceased or is growing slower and more shallow. In most cases where the breathing has been extinguished in this gradual manner, there occurs, in a few seconds, by the employment of artificial respiration, a deep gasp, which is repeated in a short time, and soon the breathing grows more frequent, till it becomes natural, and the patient is safe. Such a restoration may generally be effected, even when the chest has ceased to move and the pulse to beat, and when the patient presents all the appearances of death, but to restore life it is, of course, necessary that artificial respiration should be immediately resorted to on the appearance of these serious circumstances.

In those cases where the breathing and pulse both cease im-

mediately, and without any warning, but little good is obtained from artificial respiration.

Besides the use of artificial respiration, cold water should be dashed over the face and chest of the person whose life is endangered by chloroform, and air should be freely admitted, and all hindrance to breathing removed, indeed, everything which can hamper the breathing, as stays or a tight dress, should be removed before the administration of chloroform is begun. It may be conveniently mentioned here that the most serious impediment to the breathing, sufficient to endanger life, may be caused by the patient lying on the face for the convenience of the operator, and when this position must be assumed increased care must be paid to the state of the breathing, as such a posture is often quite sufficient to arrest feeble breathing, which, without this impediment, would continue with safety.

It is a question of some importance whether to persons in the above described dangerous condition galvanism should be used. The Committee appointed by the Medical and Chirurgical Society are of opinion that this agent is useful, but is far inferior to artificial respiration, but other persons are wholly opposed to its use, on the score of its power to arrest a very feebly-acting heart, and thus to remove any small hope of recovery which remained. It is advised to use it to the phrenic nerve, and so to stimulate the diaphragm to action, and thus maintain breathing till the chloroform shall have had time to evaporate from the blood, and free the system from its effects. But respiration can be much better maintained by artificial respiration, and sufficient air can, in this way, be introduced into the lungs to maintain life.

One fact noticed by the commissioners referred to, is of great interest and importance, namely this, when under the influence of chloroform the breathing grew shallow and slow, the heart's beats grew stronger, which fact has been thus explained. When the breathing is slow and shallow but little air is taken into the lungs, and, consequently, but little chloroform, and so the oppressed and enfeebled heart is subjected to the influence of a smaller amount of the drug. Therefore, by the time the breathing stops the heart is comparatively but little under the effects of

the chloroform, but is paralyzed, chiefly by the arrest of the respiratory movements; and we have only to keep these at work for a short time by artificial means, when the heart at once regains much of its force, and soon the blood, freed of the chloroform, permits the renewal of the breathing, unaided by external assistance. The same self-protectiug influence is at work in respect to the breathing itself; for as the influence of the chloroform progresses, the breathing becomes slower and slower, and less of the vapour is inhaled and absorbed, and the final extinction of the movement of respiration is but slowly accomplished, and by a watchful person serious consequences can generally be averted by a timely withdrawal of the chloroform inhalation.

It has been proved that a certain percentage of chloroform, which is amply sufficient to produce, in a short time, complete unconsciousness, can be inhaled with safety for an almost indefinite time. It must, therefore, be obvious that the instrument or method which is required must be one which shall enable us with certainty to give as much chloroform as we may wish; so that the quantity compatible with safety shall never be exceeded. The only instrument which will, with any approach to accuracy, fulfil these conditions is the ingenious apparatus of Mr. Clover, and its advantages are so great, as fully to outbalance the slight inconvenience which may accompany its use. If this apparatus cannot be employed, the author thinks the simple use of a piece of lint and a towel, or Dr. Simpson's method, are the best to be adopted.

Are there any conditions of age or health which forbid the use of the chloroform as an anæsthetic? The author thinks it may be given to all persons, no matter what their state may be, if due care be observed. He has seen it given to persons with serious heart disease, to persons almost dead from exhaustion from loss of blood, to children of a few weeks, and to persons close upon a hundred years old, and without any disagreeable symptoms. No doubt a dilated heart, or a fatty one, add to the risks of the patient, and enforce on the operator additional care and anxiety. The two extremes of age are also conditions which exact close watching during the administration of chloroform.

We shall next speak of the purposes for which inhalation of chloroform are performed. It is used, as is well known, to remove pain during the performance of surgical operations. For minor, and very local ones, the ether spray is undoubtedly to be preferred; for larger ones, and where the operation will be of necessity rather protracted, chloroform inhalation is the superior of the two methods.

In addition to the more obvious advantages of chloroform in operations, may be mentioned the fact that, by its use, the mortality is reduced.

Chloroform inhalation is now frequently used, and with much advantage, during delivery. It eases the pain of the mother, without increasing the dangers to herself or her child. In such cases, it is not necessary to obtain complete unconsciousness, but sufficient only to dull the pain should be given; if this recommendation is disregarded, and the anæsthetic be administered till complete unconsciousness is obtained, the contractions of the womb are considerably weakened, and the delivery thus prolonged.

It is true the uterine contractions are probably slightly weakened even if slight unconsciousness only is produced; but it is maintained by accoucheurs, this disadvantage is more than compensated by the relaxation of the parts, and the allayment of spasm which is occasioned by the chloroform.

In dentistry it is often used, but with some additional risks, as the patient is required in a sitting posture, and hence there is increased risk of syncope. For such a minor operation chloroform should be forbidden, unless under exceptional circumstances.

It may be used with the most signal benefit in renal and biliary colic. In the treatment of these diseases, in the author's experience, it is very far superior to opium, warm-bath, and the ordinary treatment in vogue; for the severe pain of these complaints is almost immediately removed before unconsciousness is obtained; indeed, it is never necessary to carry the administration of chloroform very far in these diseases. The pain, on withholding the administration, often speedily returns, but may again

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be removed by its use; and after two, or usually at most three administrations, it is permanently removed, and the sufferer soothed and put at ease.

The treatment of chorea by chloroform is a most successful one. It is especially applicable to those very serious cases in which the movements are so great and constant as to prevent sleep, and even the swallowing of food, in consequence of which speedy exhaustion and death are to be apprehended. It generally happens in such cases that a refreshing sleep is obtained after the chloroform is given, indeed the sufferer passes from the insensibility of chloroform into that of natural sleep, and after, perhaps, some hours wakes up soothed and refreshed, and with a marked abatement in the movements. This improvement is sometimes so great, that patients who could scarcely, before the use of the chloroform, be restrained in bed, can after waking, sit up, with only slight involuntary movement, and eat and swallow with ease. Soon the movements return, when again the inhalation must be repeated. At first it should be administered three times a day, then twice, and after a time, proportioned to the improvement, once a day. It is stated, that by this treatment the disease may be cured on an average of twenty-eight days. Of this last statement, the author is unable to speak with confidence, but he can in the strongest manner of the usefulness of chloroform, given in the above way in the treatment of chorea. To persons with delirium tremens, and in whom sleep cannot be obtained by the usual method of treatment, it has been advised to produce unconsciousness by chloroform inhalation. Fits of convulsions, especially in children, can be stayed by chloroform, and when they have been prolonged, and exhaustion has been threatened, the child in some cases has been brought from a state of great danger to one of safety, the convulsions being quite stayed, and consciousness restored by the inhalation of chloroform.

In the reduction of hernia, its use is obvious, and it may be used to assist the detection or diagnosis of abdominal tumours, when these are deep-seated, and the walls of the belly are hard and rigid. It is useful also in recognizing the nature of phantom

tumours, as when the patient is made insensible by chloroform, these entirely disappear.

In neuralgia, sciatica, colic of the intestines, chloroform may be inhaled, if the pain is very severe, and also to relieve distressing dyspnœa, whether this be due to asthma or aneurisms, &c.

ETHER.

We have already spoken in detail of the action of chloroform on the body, and must now refer our readers to that section, as in the main the physiological action and therapeutical application of ether and chloroform are the same. Their differences will now be shortly stated.

Ether is less frequently used as a local anæsthetic than chloroform, and is not often applied to ease the pain of neuralgias, of toothache, &c.

It is frequently employed, as the ether spray, after the method introduced by Dr. Richardson, to produce a temporary loss of feeling in some part of the surface of the body. But this it effects by its rapid evaporation and great abstraction of heat from the tissues, whereby they become frozen, and so insensible. It is thus of frequent application to prevent the pain of minor operations, such as the opening of abscesses, the removal of small tumours, the extraction of teeth, &c. Indeed it has been used, and it is said with success, in preventing pain during an amputation of the leg, and in ovariotomy, but it is scarcely likely that its use in serious and prolonged operations will become general. When the skin or mucous membrane is sufficiently frozen to permit of the operation without pain, they become pale, shrunken, and tallowy-looking, and feel as if oppressed with a great weight, while on recovering their natural condition, the parts tingle and smart, and this is sometimes so intense, as to more than equal the pain of the minor operation, to prevent which, the ether spray was used. The obvious advantage of this proceeding over

the general administration of chloroform is its complete safety, as it entails no risk whatever to the life of the patient.

As an antispasmodic and stimulant, ether may be used internally in the same cases, and under the same circumstances as chloroform.

Inhaled in the form of vapour to produce general anæsthesia, ether for many years preceded chloroform, and, although the latter has at the present time almost completely superseded the former, each has advantages over the other.

Ether differs from chloroform in the following particulars:—

It must be used in larger quantities, and requires a longer time to produce loss of consciousness and of feeling. Its effects pass off sooner, indeed, often consciousness returns almost immediately the administration is suspended; so it happens, not unfrequently, that patients become sensible of the pain of an operation, when from any cause it is found necessary to suspend its administration for a short time.

Ether produces much more excitement than chloroform.

From the labours of the Committee of the Medical and Chirurgical Society, instituted to investigate the action of these substances, it would appear that both at first strengthen the contractions of the heart. But soon, under the action of chloroform, these grow weaker and weaker as the animal passes more deeply under its influence. The case is, however, different with ether; its first effects on the heart continue, and the pulsations are often strong till the very moment of death, which is in almost every instance effected by a paralysis of the muscles of respiration. Both ether and chloroform thus destroy life by arresting the movements of respiration, but there is an additional danger in the case of chloroform, from its depressing action on the heart.

But the advantage on the side of ether is in practice more apparent than real, as loss of consciousness, sufficient for the purposes of the physician or surgeon, can be obtained from chloroform, while the pulse remains unaffected, and this only occurs when too much has been given, and when the administration has been conducted with carelessness. The respective merit of these

two substances in the production of general anæsthesia has yet to be settled. There are some who maintain that death cannot be caused by ether; such, however, is certainly a mistake, but whether the mortality from chloroform is greater than that from ether, our present knowledge does not enable us to decide.

The pain of sciatica and of neuralgia may often be permanently removed by freezing the skin over the tender and painful spots by the ether spray.

IODOFORM.

Iodoform has been of late years rather extensively used as a local application, and, apparently, with much profit.

It may be applied to sloughing sores. The indication for its employment is ulceration, without any tendency in the tissues to heal. To bed-sores, therefore, and syphilitic sores especially of the soft variety, while they are spreading, iodoform may be applied, and should be dusted on them, and the whole covered over with some bland preparation, as glycerine spread on lint.

The pain of soft chancres is said to be removed, and the sore healed by such an application.

To the nose and throat, when any part of the tissues forming these are ulcerated, iodoform has been successfully applied.

Cancerous sores may be robbed of their pain by a similar application. When applied to a cancerous uterus, 8, 12, or 16 grains of the iodoform should be mixed with some cocoa-nut fat, and this bolus be placed into any excavation produced by sloughing or ulceration in the cancer.

As a suppository, iodoform may be used in cancer of the rectum, or painful diseases of the bladder.

The pain of gout and neuralgia is said to have yielded to the local employment of this substance, but with other persons, however, it has not at all succeeded.

It has been advised to use in neuralgias, &c., a saturated solution of iodoform in chloroform.

Iodoform must not be applied to inflamed tissues, otherwise it will increase the inflammation.

Taken internally, it at first produces a kind of intoxication, and afterwards convulsions with tetanic spasms. The breath smells of the iodoform, as also do all the tissues of the animal, when its body is examined after death.

CAMPHOR.

At the temperature of the body this substance is solid, but still some passes off as vapour, even at a lower temperature. It is soluble in oils and fats, by means of which it can be introduced in considerable quantities into the system.

It is also possessed of a high diffusion power. These properties, as will be seen, influence the action of this drug on the body.

This substance is destructive of most plants, except those of the lowest organization, as the fungus, commonly called "mould." It is also a poison to fleas, bugs, spiders, &c., and is frequently used for the destruction of these insects.

When applied to the entire skin, it has but little action, unless employed in solution, when it can excite redness and a feeling of heat, indeed a slight inflammation; but to wounds and delicate tissues, as the mucous membrane, it is a more powerful irritant, and can, if in contact with these for any time, produce not only active inflammation, but even sloughs and ulcers.

Camphor has been applied to indolent sores, but its use is now superseded in such cases by other remedies. Neither is it now used in diseases of the mouth, though it is a common ingredient of tooth powders, and may be used as a corrective of foul breath.

Its influence on the mucous membrane of the nose, frontal sinuses, &c., when these are affected by catarrh, is most marked. A strong solution of camphor should frequently, and for some time, be sniffed up the nose, while, at the same time, five or six drops of the same solution on sugar should be taken, at first

every ten minutes, and then every hour. Ordinary cold in the head, and even influenza, if treated in this manner at their very commencement, can often be cut completely short, or have their violence much abated; but if the first stage of the disease is past, the remedy is without effect.

When used correctly it clears the head, removes or lessens the frontal headache, diminishes, or altogether stops the sneezing and the running at the nose.

Employed in the same way, camphor is generally useful in the following troublesome and chronic complaint:—Some persons are affected, it may be for years, with attacks of incessant sneezing and profuse watery running at the eyes and nose. With some these attacks occur daily, and may begin early in the morning and last several hours, or they may occur at any hour of the day, and there may be several attacks daily; while with other persons the attack only occurs at intervals of some days, and then may last 24 or more hours. There is frequently much frontal headache and itching of one part of the inside of the nose, which itching, in some instances, precedes by a variable period the commencement of the sneezing.

As has just been said, such attacks can generally be cut short and made very mild and insignificant, if a strong solution of camphor be diligently sniffed up the nose.

When employed to remove catarrh of the head, the solution may be dropped on a handkerchief and this be held to the nose for some time, or some of it may be poured on boiling water, and thus inhaled into the nostrils; but if the latter plan be adopted, care must be taken not to permit the vapours of camphor to reach the eyes, or these are made to smart, and the conjunctiva is inflamed. This protection can be accomplished by covering the opening of the inhaling vessel, and leaving only an opening large enough for the nose.

In the stomach, as in the mouth, this substance at first produces a feeling of coldness, which is soon followed by one of warmth; and if the quantity is great, there is produced pain at the epigastrium, with nausea and vomiting, and after death there is discovered redness, and even ulceration of the stomach. The

severity of these appearances is determined by the state in which the medicine is swallowed; for if it be in solution, it then passes into the blood, and does not tarry very long in the stomach; but if swallowed undissolved from its high melting point, it remains solid in the stomach, and thus continues there a sufficient time to excite severe inflammation.

In the intestines it behaves as in the stomach, and its effects are here also influenced by the state in which it is taken; as if swallowed in the solid form, the chief part passes through the intestines, and escapes with the fæces.

In the treatment of summer diarrhœa, and even of cholera, there is, perhaps, no remedy so efficacious as camphor; but it must be employed at the very commencement of the disease, or it will be without effect. Its influence on cholera is most conspicuous, for by it the vomiting and diarrhœa are generally at once controlled, and often altogether checked, while the cramps are removed, and warmth is restored to the extremities. The author is able to bear witness to the almost magical effect of camphor in these diseases from his own experience. In order, however, to obtain these good results, it is necessary to administer the medicine frequently; thus, six drops of a strong alcoholic solution of camphor should be given at first every ten minutes, and afterwards, when the symptoms have abated, less frequently. It is a good plan to mix it with some brandy, but it will act admirably without any such addition. In the author's observations on cholera, the remedy was employed alone.

Camphor readily enters the blood, and can be detected by its smell in this fluid, and in most of the organs of the body. What influence it has on the blood is unknown. On the heart its action appears to be capricious, but is certainly regulated by the dose. In large quantities the pulse is often retarded, but sometimes quickened, and generally is much weakened. In smaller quantities, it is said, this is made fuller, stronger, and more frequent.

By large doses the mind is somewhat variably affected; with some persons its activity is at first increased, and ideas are rapid and agreeable; but subsequently, and from the first, with others, there is great faintness, with giddiness, noises in the ears, much

delirium, and even convulsions. At the same time, the surface of the body is cold, the features shrunk, and the skin, it may be, covered with a clammy sweat. After large doses, there is often some smarting and pain of the urinary organs, with a great desire to pass water.

In disease it is mainly used in adynamic fevers, in which, according to high authority, it is very valuable. In such cases it is said to strengthen the pulse, and to reduce its frequency, while, at the same time, it moistens the skin, and removes the delirium, especially when this is of a low and muttering character. In such cases, it has been employed by Graves and others with the best results. To control delirium it must be given in considerable quantities—as much as twenty grains or more every two or three hours—but its effects must be watched. It is only right to say that, by some practical authorities, camphor has been found ineffectual as a remedy for the delirium of fevers.

It has also been recommended in melancholia, in spasmodic affections, in nervous palpitation, and hiccup.

It is reputed on high authority to possess the power to control inordinate sexual desire, but for such a purpose it must be given in considerable doses. It is said to relieve strangury.

Camphor is eliminated by the breath, and probably with the perspiration, and a small quantity with the urine. From the irritation it produces in the urinary mucous membrane, and as but a small quantity is separated by the urine, it has been assumed that some of the products of its decomposition in the body escape with the urine, and irritate the mucous membrane over which this passes, but on this subject nothing is known with certainty, and there is at present no proof that camphor is consumed in the body.

TURPENTINE.

When this is applied to the skin it excites a feeling of warmth with some redness, and if the application be a strong one, blisters may be formed. As a rubefacient and counter-irritant it is of frequent use, and may for such purposes be used

as the liniment, or a few drops may be sprinkled over a flannel wrung out in hot water, and be applied to the skin till it produces redness, tingling, and smarting. In the following form it may be usefully employed, namely, when mixed with an equal quantity of yolk of egg, which mixture is to be dabbed on the skin with a piece of sponge. As a rubefacient, turpentine may be employed for the same purposes as a mustard poultice. Thus it is sometimes applied to the chest to remove the pain of pleurisy or pleurodynia, and to the abdomen to remove that of peritonitis, or of renal or biliary colic, and along the course of the sciatic nerve to ease the pain of sciatica.

In the stomach turpentine excites a feeling of warmth, and sometimes after larger doses nausea and vomiting. With most persons it acts as a purgative, but such is not invariably the case, and if, after large doses, such does not occur, serious symptoms sometimes arise from the absorption of the turpentine, and from its action on the organs at a distance from the intestinal canal, and thus when administered in considerable doses, it is desirable to give, at the same time or soon after, some more active and certain purgative, as castor oil. Even after large doses the stomach and intestines of animals have not been found inflamed.

This drug is successful as a poison to the tape-worm, and may be used for such a purpose, but is now seldom resorted to, as there are other remedies which are to be preferred from their more certain influence on the worm and milder action on the body.

As an injection into the rectum, turpentine may be used to destroy thread-worms, but for such a purpose it is not preferable to many other substances.

There are few remedies more successful in staying hæmorrhage from the stomach and intestines, as occurs in chronic ulcer or in typhoid fever, &c. It should then be given in small doses of five to ten drops, and be very frequently repeated. Administered in the same manner, turpentine can control hæmorrhages from other organs, but this subject will be treated of in a later part of this article.

It is useful in certain states of typhoid fever, probably from its direct action on the mucous coat of the intestines. Thus Dr. Wood has drawn attention to its value in 10-minim doses repeated every two hours, when, in this disease, the tongue parts with its fur in flakes, and instead of becoming and remaining moist, dries and has a glazed look. Such a circumstance, when it happens, is usually seen towards the end of the disease, and is always accompanied by an increase of the tympanites, and an aggravation of the other symptoms. In "the course of 24 or at most 48 hours, some amelioration of the symptoms may be observed. The tongue becomes gradually moister, and covers itself with a whitish fur, the tympanitic distension ceases to augment, and after a time diminishes, the pulse becomes less frequent, and the skin less dry and harsh, and the patient enters slowly but regularly into convalescence often without any other remedy. As the case improves, the quantity of the oil should be diminished, but care should be taken not to omit it too hastily." Dr. Wood further says, "I will repeat, that oil of turpentine may be used, with great hope of benefit, in any case of enteric fever in the advanced stage, with a dry tongue."

By Dr. Graves it was employed in the same disease to remove tympanites where this was extreme. He pointed out that the remedy is of no use if, before and during the production of the flatulent distension, there be bowel complaint, and that in such cases acetate of lead is invaluable. When such tympanites are present, there is very often at the same time much prostration of the strength, with muscular tremblings and picking of the bed-clothes, and low, muttering delirium, all of which symptoms may, according to Graves, in many cases, be ameliorated by the use of turpentine. He administered it in drachm doses every six hours.

Turpentine easily passes into the blood, and may be detected in the breath and sweat, and in an altered state in the urine, to which excretion it gives an odour of violets or of mignonnette.

When turpentine is taken in very large quantities, and especially if it does not purge, and so escape soon by the rectum, it produces in most persons some excitement, with giddiness, con-

fusion of sight, with quickened pulse, and, in extreme cases, insensibility, with dilated pupils. There is also noticed, in many instances, bloody and scanty urine; indeed, this secretion may be suppressed. There is also pain along the urinary tract, with frequent and painful micturition.

As we have said, it is very powerful to check bleeding from the different organs of the body, as from the lungs, nose, uterus, and kidneys, and bladder; but when used to check bleeding from the kidneys as in Bright's disease, it must be administered in small quantities. It is also reputed to possess the power to check bleeding in the hæmorrhagic diathesis, and to be useful in purpura.

Puerperal fever has been treated with large doses of this medicine, but authorities are divided in their opinion of its usefulness.

It has been employed, according to some, with great success in sciatica, and has been recommended in doses of half an ounce, on 4 to 8 successive nights, and, if by this time no relief has been obtained, the medicine may be pronounced without influence on that particular case.

Turpentine is reputed to be diuretic, and is sometimes administered for such a purpose in small doses in Bright's disease.

It has also been used in chronic cystitis, in gonorrhœa, and in gleet.

It has been used, with apparent advantage, in biliary colic.

Group containing—

NUTMEGS.	OIL OF PEPPERMINT.
CLOVES.	OIL OF SPEARMINT.
CANELLA BARK.	OIL OF RUE.
CINNAMON BARK.	OIL OF LEMONS.
CAJEPUT OIL.	CUBEBS.
OIL OF ANISE.	BUCHU LEAVES.
FENNEL FRUIT.	BALSAM OF TOLU.
CARAWAY FRUIT.	BALSAM OF PERU.
CORIANDER FRUIT.	COPAIBA.
DILL FRUIT.	MEZEREON.
ELDER FLOWERS.	SASSAFRAS.
LAVENDER OIL.	STORAX.
OIL OF ROSEMARY.	JUNIPER.

The members of this group are either composed of, or contain a volatile oil. Some have, besides, a bitter constituent, in virtue of which they can act in some degree as the group containing bitter substances, such as gentian and calumba.

When applied to the skin, the etherial oils can penetrate the cuticle and excite slight inflammation in the living tissues beneath, and some of them have been employed, to produce such an effect, to rheumatic and gouty joints, to the face in toothache, &c., but they are in no way superior to turpentine, which is very generally at hand, and is for this reason to be preferred.

Balsam of Peru may be added to ointments, which are employed for chilblains, after these are broken.

In the mouth they have a warm, and, many of them, an agreeable taste, and thus some of them are commonly used to cover the taste of more disagreeable medicines. For such a purpose are used, oil of peppermint, orange flower-water, oil of cinnamon, &c.

In the stomach, these oils excite a feeling of warmth, and some of them have been used to increase the appetite and promote digestion by stimulating the secretion of the gastric juice. There is no proof that they can promote digestion.

In the intestines, they behave as in the stomach, and, if given

in large doses, can excite slight inflammation. Many of them, as oil of cloves, of cinnamon, of anise, of fennel, of coriander, of caraway, of peppermint, are added to purgative medicines to prevent these producing griping pains.

Many of them are useful adjuncts to astringents to check diarrhœa, as cloves and cinnamon; they can also remove colic, and, by their stimulant action on the muscular coat, expel wind from the stomach and intestines, for which purpose oil of cajeput and oil of cloves are generally preferred.

These oils probably pass with readiness into the blood, and act for the most part like turpentine.

Many of them have been used to remove spasm of different parts, but for such a purpose they are inferior to chloroform and ether. Whether they suffer any changes in the blood is at present unknown.

Many of them, as Balsam of Tolu, and Balsam of Peru and Copaiba, are given for their effect on the bronchial mucous membrane, when this is chronically inflamed and secretes a large quantity of pus.

Mezereon and sassafras are reputed to be useful in syphilis and chronic rheumatism.

Some of the members of this group, as lavender, rosemary, rue, and cinnamon, are used as stimulants to nervous and hysterical persons, and are often very useful in removing temporarily the depression of spirits and other symptoms met with in such people. They are, however, merely remedial, and soon lose their effects, unless given in increased doses.

These oils, or the resins derived from them, escape from the body in part with the breath and perspiration, but, probably, chiefly with the urine and, in their passage along the urinary tract, they stimulate or irritate the mucous membrane. Copaiba is said to have caused blood urine with strangury and much pain in the bladder.

Copaiba, buchu, and cubebs are commonly used in disease of the bladder and urethra. Buchu is generally employed in chronic cystitis, and is said to lessen the production of pus in this disease.

Copaiba and cubebs are chiefly used in gonorrhœa and gleet. The former is recommended in the chronic stages of gonorrhœa, while the latter, which must be given in large doses, is considered to be of service only in the commencement of the attack. If copaiba be given in the ordinary dose, when there is active inflammation, the gonorrhœa is sometimes aggravated. Copaiba has been used especially for women as an injection for gonorrhœa.

Storax and Peruvian balsam have been used in itch, and both are said to be very effectual in removing the disease.

The following preparations may be used:—Storax, an ounce; olive-oil, two drachms; with this every part, except the head, is to be carefully rubbed, and, it is said, after one application the insects, when removed from their burrows, are found to be dead; but, for the sake of certainty, a second application, in 12 or 24 hours, should be employed.

A bath should, for the sake of cleanliness, be given before this treatment is begun, and when it is concluded; but this application is not, it is said, necessary to the success of the treatment.

This application does not produce any irritation of the skin, and the preparation has the additional advantage of an agreeable smell.

The following preparation of storax has been highly praised: Rectified spirit, two drachms; storax, an ounce; olive-oil, a drachm. The first two ingredients are to be mixed together, and afterwards the olive-oil added to them.

The author has tried these applications in itch, and although they appeared to do good, yet in every instance sulphur ointment was required before the disease was completely removed.

Copaiba occasions, in some persons, a rash, which may be like urticaria, but sometimes simulates very closely the papules of measles. It may be distinguished by the absence of fever, and the duration of the rash, which lasts some time, if the medicine is continued; and it may be further detected by not beginning at the face, and from thence passing downwards over the body, but is from the first situated only at places, and leaves the rest of the body unaffected. A favourite seat is around the joints, and,

lastly, in those cases where it is denied by patients that copaiba has been taken by them, this substance may be detected in the urine, both by the smell, and with still greater certainty, by chemical reagents, for, on the addition to the urine of cold nitric acid, there is a turbidity produced if copaiba be present, which turbidity is dissolved by heat. The copaiba may also be extracted from the urine by shaking it up with ether.

It has been stated these etherial oils may pass out of the body with the urine, but from Weikart's experiments, quoted by Parkes, this does not appear to be the case with copaiba, whose volatile oil is destroyed in the body, and only its resinous acid appears in the urine.

Juniper is used as a diuretic, and is praised by some for its use in this respect, in the dropsy which follows scarlet fever.

VALERIAN.
VALERIANATE OF ZINC.
VALERIANATE OF QUININE.

In many respects valerian acts as turpentine and the preceding group, thus it excites a feeling of warmth in the stomach, with a quickened pulse, and some mental excitement which may, after large doses, reach active delirium.

It has been considered by some an anthelmintic of much power (Neligan), and has been especially recommended when there is at the same time any convulsive affection.

Valerianate of zinc may often be given with very great advantage to women, who suffer from those numerous distressing and changeable symptoms, included under the name hysteria. These are most often witnessed in women at the time the catamenia cease, and then for several years their life is made wretched by these sufferings. Their symptoms can often be traced to some disease of one or more organs, and especially to uterine derangements, and sometimes to piles or dyspepsia. When any such departure from health can be discovered, the treatment must be

directed to the removal of this, but not uncommonly after all discoverable disease has been removed, or in cases where no cause for the symptoms can be found, valerianate of zinc proves of the greatest service. Oxide of zinc in the same cases does good, but is certainly inferior to the valerianate. Still it is right to say in many instances the valerianate of zinc fails entirely to give any relief in the very cases it may be, where we should expect it to be useful. At present our knowledge of the conditions indicating the employment of these medicines is not sufficiently precise to enable us to predict, with certainty, that good will follow their employment.

The following are some of the symptoms which these remedies can in many instances remove. Flushings of the face, "hot and cold perspirations," restlessness and nervousness, and depression of spirits met in the class of people of whom we are now speaking.

Also the stricture of the throat, and the feeling of suffocation, throbbing of the temples, fluttering at the heart, &c. As we have said where these symptoms occur in hysteria, they may often be removed by these medicines, although their very disagreeable taste is a circumstance which will always limit their employment. By some valerian or its tincture are preferred, and by such, much of the good obtained is ascribed to the volatile oil these contain. Other authorities prefer the salts of valerianic acid.

Valerian has been used in epilepsy, and apparently with occasional advantage, but whether the cases over which it prevailed were true epilepsy, or merely the hysterical form of the disease, it is impossible to decide.

Valerian, like the medicines to which it is allied, may be used as an anti-spasmodic, but it is inferior to some other medicines of this class. Occasionally facial neuralgia has yielded to valerian, which is preferred by some in the form of valerianate of zinc. The paroxysms of whooping-cough are also made milder by these remedies, and chorea is sometimes benefited by them.

SAVINE.

Savine is an irritant, and excites inflammation in the tissues when applied to them. It has been used for this property to keep open and discharging, blistered surfaces, but is scarcely likely to find such employment in the present day.

It is employed both in menorrhagia and amenorrhœa when either of these complaints is owing to an atonic state of the body, and a corresponding state of the uterus. It is commonly used to produce abortion.

ASSAFŒTIDA.
AMMONIACUM.
GALBANUM.

These medicines have, in the main, the same action on the body, but assafœtida, probably from its containing the most volatile oil, is the most powerful of the three.

In the mouth and stomach assafœtida excites a feeling of warmth, and at the same time expulsion of wind from the stomach and intestines. In large doses it produces in most persons nausea and vomiting, and at the same time increases the secretion from the mucous membrane of the intestines, and hence the softness, frequency, and bulk of the motions are increased. The active principle passes into the blood, but probably not very rapidly, as after the administration of this medicine the eructations for twenty-four hours, or longer, are offensive with its smell.

By it the pulse is generally quickened, but sometimes made slower, and there is with many people a feeling of exhilaration, and sometimes "various nervous or hysterical phenomena, and a general sense of malaise" (Jörg, quoted by Stillé). It generally excites headache and giddiness. By it the bronchial secretion and perspiration are said to be increased.

It must be remembered that all persons are not thus affected, as Pidoux took enormous doses of the medicine, and experienced no change nor inconvenience, except from the offensive smell of his excretions.

Assafœtida is of most use to remove the distressing symptoms of hysteria. It is of especial use from its power over those situated in the intestinal canal, and can very generally afford considerable relief when such patients are tormented by great flatulence, which it quickly dispels. It also removes flatulent colic. Many of the pains and sensations felt in the head by such persons yield also to assafœtida.

The flatulence of young children, when not connected with either constipation or diarrhœa, is best treated by assafœtida. A drachm of the tincture should be added to half a pint of water, and of this a teaspoonful administered every hour. In such a strength children rarely refuse to take this medicine, while it is strong enough to speedily relieve them of their distension. When the flatulence is due to constipation or diarrhœa, assafœtida will do very little good.

This remedy has been recommended in asthma, and it, with the other members of this group, are useful in chronic bronchitis with much wheezing and abundant discharge, which circumstances are generally met with in elderly people. In such cases ammoniacum is generally preferred to assafœtida.

ON CANTHARIDES, BLISTERS, AND COUNTER-IRRITATION.

This medicine is at present most frequently used as an external application, and as an internal remedy has of late years fallen undeservedly into disrepute.

Skin.—When applied to the surface of the body in one or other of its preparations, it soon excites tingling, smarting, and a feeling of heat. The papillæ of the skin shortly become reddened and raised; next, in a variable time, determined by the

strength of the application, minute vesicles form on these papular elevations, which vesicles gradually enlarge, and by their lateral extension soon coalesce, so that blebs of different sizes are produced. These vesicles and blebs are filled with a fluid rich in albumen, and which also generally contains some fibrin.

It is of very great importance to recollect in the employment of these applications that their effects on the body are very different, according to the degree of their action—that their effects are very different when extensive vesication is produced than when their employment is limited to the production of some redness with the formation of a few small miliary vesicles.

The double effect of blisters, according to the degree of their action, has been well insisted on by the late Dr. Graves. Their first action is that of a stimulant to the body generally, and also to the individual organs in whose neighbourhood they are applied. But if allowed to remain on the skin long enough to produce much vesication, and to form large blebs, their effect is to depress the powers of the body by acting as depletives in proportion to the amount of serum withdrawn from the vessels, and so lost to the system. We might indeed as well bleed the patient to the same amount, as the serum of blisters contains almost as much albumen as the blood itself. This depressing effect of blisters is often witnessed when their action has been pushed too far with weak people, who are considerably depressed by the loss of the serum, and who often remain so for several days. It thus appears, as we have already stated, that blisters, according to the degree of their action, exercise a different, and even opposite influence on the body.

Should it be held desirable to reduce somewhat the strength of the patient, and if at the same time a counter-irritant effect on any of the individual organs or tissues of the body is desired, then a blister may be applied, even to vesication. Such energetic and depressing treatment is seldom called for, as most of the good effects of blisters follow on their milder application.

We now proceed to speak of their action as general and local stimulants.

By Dr. Graves blisters were largely employed as general stimulants to persons in the following critical condition:—With acute diseases, such as the idiopathic fevers and inflammations, it not unfrequently happens that persons already weak and much prostrated have their dangers greatly aggravated by the following mental state:—They become apathetic and unobservant, which condition increases till it even reaches partial insensibility or coma, and they can only with difficulty be roused, and then wear a stunned, stupid, and vacant look, and understand very imperfectly what is said to them. The body generally, sympathises with this depressed condition of the mind, and its functions are more and more languidly performed, till those necessary to life altogether cease. It is a condition which may not inaptly be compared to one produced by poisoning with opium, where there is partial coma, which produces a lethargy in the functions of the body, whose activity grows less as the coma continues and deepens. But with a patient in the state of which we are speaking, there is no true and refreshing sleep, and although partially comatose they are not refreshed as by sleep.*

With patients in such a precarious state it is of all things necessary to arouse them from their state of lethargy, and with the restoration of consciousness and activity of mind there occurs renewed vigour in the functions of the body, and the patient is removed from a state of imminent danger to one of comparative safety. To accomplish this desirable object, blisters of large size in quick succession and for a short time should be applied to different parts of the body, for instance, to the chest, to the abdomen, and to the thighs and calves. When applied in this manner, they not unfrequently accomplish all that is expected and desired of them.

The great value of flying blisters in these circumstances will

* This, indeed, is a condition in which sleep is most urgently needed, and often more good can be obtained at such a time by an opiate and plenty of stimulants, carefully given, to produce a refreshing slumber, out of which the patient wakes strengthened and much improved. (See Opium.)

If the functions are very languidly performed, then this blister treatment may well precede the use of opium.

be the better understood when it is called to mind, that the critical condition just described generally occurs near the end of an acute illness, and when, if the patient can be kept alive for one or two days, the danger of death will be nearly past, as acute diseases have a definite duration, and if life can be sustained long enough, they must decline, and leave the patient. It is by accomplishing this, by rousing the patient, and supporting life a little longer, that blisters not uncommonly save the patient.

These preparations of cantharides may be applied as stimulants of special parts of the body, when, for instance, with a general condition like that mentioned above, there is fear of hypostatic congestion of the lungs, and of pneumonia in which such congestion often ends,—flying blisters applied to the chest, and perhaps as recommended by Dr. Graves, along the course of the pneumogastric nerves, may brace up the vessels, and avert a most serious and often fatal complication. Or it may be desired when great weakness exists to stimulate the heart, and to strengthen its contractions. This can often be accomplished for a short time by flying blisters or weak mustard poultices placed over the precordial region, and the good thus temporarily produced can be maintained by a free administration of alcoholic drinks.

By many medical men flying blisters and mustard poultices are largely employed in various diseases of the deep-seated organs, as in pleurisy, pneumonia, asthma, biliary and renal colic, &c.

It is a question of much interest and importance how such local applications can affect parts distant from them, and which have no vascular connection with the part of the skin to which the blister is applied. To such a question a satisfactory answer cannot at present be given; but it is probable the impression is conducted through the nervous system, and probably through the sympathetic nerves.

The effects of local applications on parts distant from them is seen in the following facts:—

If one hand be placed in ice or cold water, the temperature of the opposite hand is also reduced.

And again it has been shown by Brown-Sequard, that irritation of the skin of the back over the kidneys causes a contraction of the arteries supplying these organs.

Again after the employment of blisters or counter-irritants to the chest, the pleura beneath is found in some instances to be reddened, injected, and inflamed; and further an irritant placed over a joint filled with fluid from rheumatism or synovitis, often at first increases the effusion into the cavity, and indeed such an occurrence may be accepted as an indication of the success of the application. It is not, however, necessary nor desirable to produce this increase of the disease, if it can be avoided.

Moreover, the following facts show, that by mere contiguity, or by mere contact, disease may be spread, and hence impressions by medicinal agents may in a similar manner be conveyed. In the mouth it commonly happens with ulcerative stomatitis, for the part of the cheek and tongue corresponding to the ulcerated gum to become inflamed and ulcerated. The same extension of inflammation and ulceration by mere contact is seen also in other places.

We have in the foregoing facts proof of the possibility of the conduction of impressions or diseases, to distant parts, and the results of applications in disease abundantly show that such distant effects do constantly occur.

In pneumonia and pleurisy, as we have said, blisters are frequently employed. Yet there exists among members of the profession a great difference of opinion, not only as regards the stage of the disease in which they are useful—but even as to their utility at all. By some it is maintained, if blisters be employed during the febrile stage of these diseases, they increase the fever, and this is held to be sufficient to forbid their use. Such an increase of the fever is certainly very slight, if it occurs at all, for the author has never been able to excite fever in fever-free persons by blisters, neither has he seen by their use any increase of an already existing fever.

By those who employ these applications in the above-named diseases, the following good results are said to follow:—

In pneumonia they are said to remove the pain, quiet the

cough, and to lessen the expectoration, effects which, if true, are sufficient reasons for their employment.

It must, however, be remembered there are competent authorities who deny these statements.

Whatever doubt may exist as to the influence of these applications on acute pneumonia and pleurisy, most observers are united in the opinion that they are able to lessen the pain of these diseases, and by their power to do this, they must benefit the patient, by removing restlessness and the oppression consequent on pain, and by permitting sleep. But in estimating their value, it is necessary to recollect, that in these acute affections, the severe pain which is one of their most frequent symptoms, is of short duration, and of itself, lessens or disappears in about forty-eight hours. It is, perhaps, not superfluous to again caution against free vesication, for all the good effects of blisters will generally follow on the production of simple rubefaction, and by adopting the milder treatment the patient is spared much annoyance from a painful sore, and from the depression which invariably ensues on the loss of much serum.

Opinion is more agreed on the usefulness of counter-irritation in pleurisy, when the inflammation and fever have subsided. If employed immediately this occurs, and if the flying blisters be applied frequently, and of large size, and are quickly healed, they further the absorption of the fluid in the pleural cavity, and lessen the risk of the disease remaining indefinitely chronic. It has been remarked that the counter-irritation should be frequently used, and the vesication, if it occur, at once healed, for all the good effects of counter-irritation are accomplished during the first few hours of its use, and while it stimulates the skin. The hope which is sometimes entertained, that by free vesication and the maintenance of the discharge by irritating ointments, the fluid may be, as it were, drained off from the loaded pleura, is altogether a fallacious one. By such treatment important nutritive material is drained from the system, and the patients thus weakened when strength of constitution is most needed.

The effect of counter-irritation of the chest on the pleura—

its power to redden and even inflame it—has already been alluded to.

By many, counter-irritation is considered worse than useless when the effusion in the pleura has lasted a long time. Such, indeed, is the case if a free discharge of serum is produced, but if employed as flying blisters, then—although the long continuance of the effusion no doubt greatly lessens the chance of improvement by any treatment—the absorption of the fluid may in some cases be considerably aided. If such applications are useful in no other way, they may be profitable from their power to remove the troublesome intercostal pains which often accompany chronic pleurisy. For this last purpose a mustard poultice is to be preferred to a blister.

Counter-irritants are often of signal service in asthma, when they remove the oppression of the breathing. They are also useful during the passage of renal and biliary calculi.

Counter-irritation, as flying blisters, is useful in many other diseases, as phthisis, phlebitis, sciatica, facial paralysis, gleet, leucorrhœa, rheumatism, gout, and pleurodynia.

To the chest, in certain forms of phthisis, counter-irritation is of the very greatest benefit. In acute and rapid forms of this disease it is of little other service than to remove pain. But when the disease is chronic—when we have to treat what is now called the fibroid lung—much good follows the use of active counter-irritation of the chest corresponding to the disease, if the cough is paroxysmal and violent, or frequent and distressing, preventing, in either case, rest and sleep. The cough is, after such treatment, often quickly quieted, while at the same time the expectoration, which may be profuse, is much lessened, and thus a severe drain on the powers of the body is removed.

In the use of blisters to such patients, it is most necessary to avoid vesication, or the exhaustion produced by the loss of serum may be so great as to endanger even life. In phlebitis of the superficial veins much good results from a blister applied over the course of the inflamed vein. It reduces the inflammation, hastens

absorption or liquefaction of the coagulated blood, and so assists to restore the circulation through the obstructed vein.

The pain of sciatica may sometimes be relieved, or even removed, by a blister applied over the parts of the limb affected by the pain.

In paralysis of the seventh nerve, dependent on alterations in the periphery of the nerve from drafts or cold, the disease may in some cases be quickly removed by painting the skin over the paralysed muscles with blistering fluid. The earlier in the disease the application is made the greater is the probability of its producing good results.

Chronic indolent unhealing ulcers may have applied to them, with success, a blister which excites inflammation, followed by a slough. This, on separating, leaves a healthy, clean, and healing wound. This treatment, though successful, is painful, and as it is not superior to other easier and less painful methods, it has fallen into disuse.

When gleet obstinately resists all the usual methods for its removal, it may in some cases be lessened by a blister applied to the perinæum and along the course of the urethra, while one applied over the sacrum is sometimes useful in obstinate cases of leucorrhœa, a treatment, however, which cannot be very strongly recommended, as there are few cases which will not yield to simpler and more appropriate management.

In rheumatism blisters are of the very greatest service. Flying blisters, as they are termed, may be applied in the close neighbourhood of an inflamed and painful joint, the pain of which it very quickly removes, and with the ease thus brought sleep often comes, and with it a general improvement in the condition of the patient. But blisters have been of old recommended as the sole or chief treatment of acute rheumatism, and by some they are applied till free vesication is produced, with the hope, a doubtful one, of removing from the blood, the poison on which the rheumatism is supposed to depend. This method has the disadvantage of reducing the strength of the patient in proportion to the quantity of serum lost, and by the depletion, as is well known, we make the disease a lingering one. By this means

we also much prolong the subsequent convalescence, which is usually sufficiently tedious after a severe attack of rheumatic fever, as this disease produces more anæmia than most other complaints. The advocates of free vesication assert that by this method the attack is made much less severe, and much shortened, and that the danger to the heart is most considerably lessened. In forming this conclusion, the author thinks due regard has not been paid to the great influence age has on the duration of an attack of rheumatic fever, neither do the cases reported appear to have had a speedier recovery than is frequently met with in persons of the same age and with the same temperature of the body, to whom no medicine at all is given.

But although the cases reported to support this treatment are not in the author's opinion sufficiently favourable to do so, yet he has no doubt of the very great service of these applications in rheumatism. Their good effects can be explained by the removal of the troublesome and often agonizing pain, when the patient is enabled to obtain quiet and refreshing sleep, which does more to lessen the fever, to restore the appetite, and curtail the disease than our most reputed medicines.

These good effects follow the use of flying blisters more surely than the use of those which produce large blebs with considerable separation of serum from the blood.

The pain of gout may be relieved by a blister, as may also that of pleurodynia. Usually the latter painful affection will readily yield to milder treatment. Obstinate cases, however occur, which resist the usual applications and remedies, but in which the pain is soon reduced by a blister, applied over the painful part.

In treating this affection, free vesication sometimes succeeds better than mere rubefaction, although from the loss of serum, the improvement may not be apparent for two or three days, indeed at first the pain may be somewhat aggravated by the temporary weakness caused by the loss of serum.

After the application of cantharides, the active principle may be absorbed in sufficient quantity to produce congestion of the kidneys, strangury, and other disagreeable symptoms which follow on a too large dose of this medicine. For this reason blisters

should not be employed in the treatment of acute or chronic Bright's disease, as we are unable to regulate the quantity which will be absorbed, and it may happen that enough to do great damage to the patient may be taken up by the skin.

We hope it has been made sufficiently plain, that the application of the preparations of cantharides should not in the great majority of cases be continued long enough to cause much vesication. The vesicles produced should not be opened, but be covered over with a layer of soft cotton wool, and this be allowed to remain till the serum effused under the cuticle is absorbed when a superficial desquamation follows, and no troublesome consequences need be apprehended. If their action be carried far enough to produce large blebs, the serum will not be absorbed, and the bleb will at last burst. Still it is not advisable to open the blister, but to allow the dermis underneath first to partially heal when no ulceration need be feared.

If the bleb is punctured, it may happen that the air irritates the raw surface, and produces much inflammation, which may end in an extensive slough. This is especially apt to follow the use of blisters when they are applied to young children, or to old people, or to persons whose health is much broken, as the victims of Bright's disease, &c. Hence it is generally considered advisable to use to such persons other counter-irritants.

It will be seen from what has just been written, that mustard poultices which produce abundant rubefaction, in the author's opinion, are generally as useful applications as blisters. The way in which the one differs from the other will be dwelt on when the action of mustard is considered.

Mouth.—These preparations used internally, produce an unpleasant burning taste, and if in large quantities, inflammation and vesication. This remedy is not used in any diseases of the mouth.

Stomach.—On this organ it exerts an action in all respects similar to that produced in the mouth. Even small doses cause a feeling of smarting in the œsophagus, pharynx, and stomach, after larger quantities there occurs inflammation of these parts and of the intestines, and hence there is vomiting, with diarrhœa,

of blood and slimy stools, with much pain and difficulty in swallowing, and often with general peritonitis, with which the system sympathises, and fever with a high temperature and quick pulse occurs.

From the stomach and intestines the active principle passes into the blood. Its passage has not been chemically demonstrated, but the symptoms which follow the administration of cantharides render this certain. For after a large dose there occur all the symptoms of acute inflammation of the kidneys with those of much irritation, or even inflammation of the urinary and generative organs, and if the dose has been a large one, headache, loss of sensibility, convulsions, and death.

Behaviour in the Blood.—What changes cantharidine produces in the blood after its absorption are at present unknown.

The tincture or powder has been given in chorea and epilepsy, but their use in the treatment of either disease has now fallen into complete disuse.

Concerning the separation of the cantharidine from the body, but little is known. From its volatility, it is conjectured that some may pass off by the lungs, but if such be the case on its passage through the lungs, it apparently produces no changes in the mucous membrane of the air passages. From the same property, it is probable some of the cantharidine passes off by the skin, and the preparations of Spanish fly are recommended by several eminent French dermatologists as useful for psoriasis, eczema, lichen, and prurigo. The chief part of the active principles of cantharides, escapes by the kidneys, and as we have said acts as a strong irritant to the urinary and sexual organs.

The preparations of this medicine have been recommended by high authority in certain forms of Bright's disease, but it has for many years been considered a most dangerous remedy in disease of this kind, and its use is customarily condemned in most books which treat of kidney diseases.

The discrepancy respecting their usefulness perhaps arises from the difference in the dose in which it has been administered by different observers. The author is convinced of its usefulness in acute Bright's disease, when the acute inflammation and fever

have subsided, as they invariably do about the 5th to the 8th day. After the subsidence of the more acute disease in the kidney, it not uncommonly happens that a chronic one follows, and in consequence the urine continues small in quantity, and contains albumen, and perhaps blood. If just at this time, that is on the immediate subsidence of the acute inflammation, tincture of cantharides be given in one minim dose, to be repeated every three hours, the blood will almost always very quickly disappear, while the albumen more gradually decreases, and the urine becomes more abundant. It is true at such a time, it is not unfrequent for similar changes to happen without any treatment, but the influence of the cantharides can often be tested in the following way. On its administration, what has been above described occurs, but if the medicine be now withheld, both blood and albumen return in the urine in their original quantity, but both these may again and again be lessened by a return to the cantharides. The influence of the cantharides over the blood is speedier and greater than over the albumen of the urine.

Cantharides, in a similar dose, has been recommended even in the acute stage of Bright's disease, and when the kidney has undergone fatty degeneration, and secretes very little urine.

After its separation by the kidneys it acts as an irritant to the urinary tract, and may be employed in cystitis, gonorrhœa, and gleet. A drop of the tincture, given three or four times a day, is particularly useful in cases of the following kind:—There is frequent desire to make water, and which is accompanied by great pain in the region of the prostate gland, and along the urethra; and even at other times severe twinges of pain are felt in the same part. The urine may contain a small amount of pus. Such pain, and the other symptoms, may generally be speedily removed by cantharides.

Tincture of cantharides is very useful in the incontinence of urine of the aged, and sometimes in that of children. With the latter it is inferior to belladonna, although, unfortunately, both remedies fail in a not inconsiderable number of cases.

A drop of the tincture, three times a day, will in the majority of cases remove chordee.

These remedies affect also the generative organs, and after large quantities of the medicine these parts are congested and inflamed, and often in the male there occurs erection of the penis. These effects are generally explained by the sympathy of these organs with those of the urinary tract.

Cantharides has been employed to produce abortion, and is sometimes successful, but the dangers are so great as to deter any medical man from adopting this way of producing abortion. It certainly sometimes excites the sexual appetite, and has been often given criminally for this purpose.

MUSTARD.

Mustard is of very general employment, in the form of a poultice, as a counter-irritant or an excitant, and much therefore that has been said of blisters applies to mustard poultices. As has been elsewhere stated, cantharides need seldom be applied to produce vesication, and it is still less desirable to do this with mustard, as the sore which is then left is an intractable one, healing slowly, and paining greatly.

But although mustard may be used in all cases where we should employ cantharides short of vesication, still there are differences in their action which must be understood and remembered.

For an explanation of counter-irritants, and the conditions when to apply them, we refer our readers to the section on cantharides. We would here only remark what was omitted at that place, namely, that counter-irritants do not appear to diminish fever, that is, lower the temperature of the body, when this is due to inflammation. For no such a reduction of the preternatural heat is noticed when careful observations are made with the thermometer. The differences of a mustard poultice from a blister will now be spoken of.

While blisters act slowly, and produce but little pain, mus-

tard poultices, on the contrary, are accompanied by a feeling of burning, and very great pain, which soon becomes unendurable, and if not in a short time removed they produce troublesome vesication. A mustard poultice, therefore, cannot in most cases be kept in contact with the skin for more than twenty minutes or half an hour, and if the skin is delicate, as it is with children and many women, it cannot be endured for even so long a time as this. Thus mustard poultices differ from ordinary blisters in two ways, they cause much pain and have a short and sharp action. From their painfulness they are of more use than blisters when it is desired to rouse patients from drowsiness and coma, as in poisoning by opium or alcohol, or in certain conditions met with in the course of fevers. (See Cantharides.)

The energy of their action is often a disadvantage, as well as an advantage. It is an advantage when it is desired to remove pain, as of pleurisy or pleurodynia, and when, of course, the sooner the pain is removed the better.

Where we wish for a prompt action, mustard is to be preferred to cantharides. On the other hand, this energy of action is a disadvantage if it is desired to effect a prolonged influence on a diseased organ or tissue. Blisters are then to be preferred to pure mustard poultices, although mustard may still in such cases be employed, and its action made to resemble that of cantharides if it be diluted, according to the circumstances of the case, with a variable quantity of bread, oatmeal, or linseed meal.

Such a mustard poultice is quite as good an application as cantharides, and when it is remembered how difficult it is so to adjust the time of application of the latter that rubefaction without vesication shall be produced, it will become apparent that mustard poultices can be employed in most cases with greater safety than, and equal advantage to, cantharides.

There is a prevalent idea, perhaps a true one, that cantharides is more searching in its action, and affects more thoroughly the deep parts of the body. If this be true, it adds somewhat to the advantage of cantharides.

When these poultices are employed to affect deep seated

diseased organs, as the lung in pleurisy, pneumonia, or asthma, not only should their action be a prolonged one, but their size should be great, as the larger the surface of the skin which is attacked by them, the greater their influence on organs beneath. Small mustard poultices no larger than the hand are useless except when employed to remove a very localized pain. They should be of large size, diluted with bread or oatmeal, sufficient to cover the front, or back, or both of these parts of the chest, and should be continued for five, six, or more hours.

With children the whole chest should be enveloped in a poultice, which may be retained in its proper place by the following contrivance:—A piece of linen, sufficiently large for the purpose, and on which the poultice is spread, should be chosen, and on this tapes are to be tacked, that they may be tied over each shoulder, and at three places in front of the chest. These poultices must be made with tepid water, for with boiling water the active principle is evaporated, by vinegar it is destroyed, and by alcohol its formation is prevented. When they are removed the skin should be sponged with warm water, or, if the smarting be great, with ether, when a layer of cotton wool should be applied, which, although for the first few minutes it aggravates the pain, soon subdues it altogether.

A general mustard-bath, when appropriately used, often accomplishes very great good. It is almost exclusively used with children, on account of their size. It may be employed when the rash of any of the eruptive fevers recedes, in order to bring this back to the skin, and to relieve the child of the very great oppression such a recession produces. Again, in severe general bronchitis of children this form of bath may be of great service as a general counter-irritant. A table spoonful of mustard should be added to a bath sufficiently large for the child, who should be held in it by the nurse till her arms tingle and smart.

As a sitz-bath mustard may be used to redden and irritate the skin of the buttocks and thighs of young women in whom the catamenia have ceased to appear. They should only be employed a few days before and during the time the discharge should be present, and must be discontinued at other times. Such baths

considerably assist to restore to the uterus the regular performance of its functions.

Added to a hot foot-bath, mustard is used to relieve headache, congestion of the head, and inflammation of the internal organs.

In the mouth it causes a burning, stinging taste, and excites a copious flow of tears and saliva, with running at the nose and sneezing.

In the stomach after its use there is a feeling of warmth and slight pain, which latter is mistaken for hunger, and so mustard has been supposed to sharpen the appetite and promote digestion. Such is not the case, for it has been proved to cause no increase of the gastric juice.

It is somewhat strange a substance which acts so powerfully on the skin should affect but little the mucous membrane of the stomach, but such is the case, for considerable quantities may be swallowed and only produce nausea and sickness. The mildness of its action on the mucous membrane cannot be explained by its being expelled by the vomiting it produces, as even when retained it excites very little inflammation in the stomach. As an emetic mustard is not uncommonly used, when no other more appropriate one is at hand, and when no time can be spared. It appears to have very little action on the intestines, beyond making the motions moister.

Some of the active principle passes into the blood, but it is unknown what influence this has on the organs to which it is conveyed. It is reputed to be a diuretic, but its action in this respect is doubtful, neither is the class of case in which it is supposed to act discriminated by its advocates.

It is said to be useful in whooping-cough.

CAPSICUM.

Capsicum, when applied to the skin, irritates and inflames it, and produces redness, a feeling of warmth or burning, and even vesication, but none of its preparations are often employed

for such a purpose, although the tincture has been lightly painted over chilblains before they have broken, but this application is inferior to the ointment or the tincture of iodine. In the mouth preparations of this substance have a burning hot taste, and act as on the skin. The tincture as a gargle, in the proportion of a drachm to half a pint of water, is useful in some sore throats, and may be applied under the same conditions which indicate nitrate of silver. Thus, in the early stage of tonsillitis or pharyngitis, these substances, which both act as irritants, may be employed, and can then check the inflammation at its beginning, but when the inflammation has continued, and the deep parts are affected, and the tissues much swollen, irritants of any kind will do great harm. In malignant sore throats the same gargle of capsicum may be used with advantage, when it stimulates the tissues into a healthier condition, and here again its action is similar to that of nitrate of silver. In relaxed throats, when the mucous membrane is bathed with a grey mucus or with pus, the same gargle may be employed, although it is probably not superior to the glycerine of tannic acid.

In the stomach it acts as an irritant, and if taken in very large quantities it can produce gastro-enteritis. It is often used as a condiment with the hope it may assist digestion, but whether it can do so or not is as yet undetermined, but this much is known, that by habit the stomach becomes accustomed to capsicum, and large quantities must at last be eaten to produce any effect.

It has been employed by some persons in the dyspepsia of drunkards, and it is reported to do great good by removing the feeling of sinking at the epigastrium, and by promoting appetite and digestion. To such persons 8 or 10 drops of the tincture may be given shortly before their meals, or whenever they feel a great craving for drink. Capsicum has been praised in delirium tremens.

It is also very useful in some diarrhœas, such as occur in the hot months of the year, and those which are left after the irritant which first caused them has been expelled. It may be used in flatulence.

IPECACUANHA AND ITS PREPARATIONS.

When applied to the skin ipecacuanha after some time produces a feeling of warmth, attended by redness, and the formation of papules, or even pustules, which latter are not followed on their healing by pitting or scarring of the skin.

It has a bitter, disagreeable taste, and so excites a flow of saliva.

In some persons the minutest quantity produces very considerable changes in the membrane covering the eyes, lining the nose and respiratory tract. With such, on smelling the drug, or entering a room where it is kept, there soon occurs swelling of the loose tissues around the eyes, with injection of the conjunctiva, repeated sneezing, abundant discharge from the nose, and severe tensive frontal pain of the head. There is also much oppression at the chest, with frequent cough, and the signs and symptoms of bronchitis. The ipecacuanha thus excites symptoms and appearances similar to those met with in hay fever, that is it excites a catarrhal inflammation in the mucous membranes specified above. It is very highly probable that ipecacuanha produces similar results, although to an infinitely smaller extent in all persons, and that in its action it differs only in degree. Indeed, it is probable we shall see, as we proceed, that ipecacuanha affects all the mucous membranes of the body.

Small doses produce in the stomach a slight feeling of smarting, with increase of mucus. Larger doses excite nausea, and a still greater production of mucus from the stomach and from the bronchial tubes. Such an increase of mucus occurs with all nauseating medicines, but probably ipecacuanha does so over and above its action as a nauseant and emetic. In animals large doses are stated to produce inflammation of the mucous membranes of the stomach, intestines, and bronchial tubes.

This remedy is frequently used in catarrh of either the stomach or lungs, and especially in the latter when the secretion is abundant and tenacious.

In larger doses still, it produces both nausea and vomiting

and, like all other emetics, some general weakness, with sweating, and if there be any spasm, relaxation of it. Thus the drug is, in nauseating doses, both diaphoretic and antispasmodic.

It is a mild, tardy, but certain emetic. The vomiting it produces is much repeated, but is not accompanied by much nausea or prostration of the strength, and in this, as also in acting less on the bowels, it differs from tartar emetic. On account of its tardy action as an emetic it is not advisable to use it in cases of poisoning, and the sulphates of zinc or copper are to be preferred.

On account of its slight irritant action on the mucous membrane of the stomach, and perhaps by the strong movements it produces in the organ when it excites vomiting, ipecacuanha is found of use in irritative dyspepsia, both of the acute and chronic kind. It is a favourite practice with some practical authorities in such cases occasionally to give ipecacuanha in emetic doses. It is sometimes given to produce vomiting in children with bronchitis, when the obstruction to their breathing is great from the mucus in the bronchial tubes. By the movements of vomiting much mucus is mechanically expelled, and the breathing is then temporarily improved. On account of the mildness of its operation, ipecacuanha is to be preferred in such cases, and also as an emetic for delicate persons.

The quantity required to excite vomiting varies very greatly in different people.

Whether ipecacuanha produces vomiting by its direct action on the stomach or on the nervous centres, or both, are questions which are unsettled. When emetina is injected into a vein, it still excites vomiting, and the same has been seen to occur with tartar emetic; but with this latter drug, as after the removal of the stomach, and the injection of the antimony into the veins, vomiting still occurred, it is evident with this, vomiting is produced by its effects on some other part than the stomach, and probably on the nervous centres which regulate vomiting. It may be, the same is the case with ipecacuanha.

There are few remedies so powerful to check some kinds of vomiting as ipecacuanha. In drop doses of the wine, administered every hour or three times a day, according to the urgency of the

case, the author has seen it, in abundant instances, check the following kinds of sickness :—

1. Of pregnancy, especially when this is not accompanied by and dependent on acidity of the stomach, but even these circumstances do not preclude the use of this medicine. In vomiting of this character, one drop of ipecacuanha wine, given three times a day, will, in the great majority of cases, give complete relief.

2. The morning vomiting of drunkards; but this can be still better controlled by the solution of arsenic.

3. The morning vomiting which sometimes accompanies general weakness, and is met with in convalescents from acute diseases, and in persons recovering from child-birth.

4. It often controls immediately the vomiting of acute catarrh of the stomach in children. Indeed the remedy appears to have a greater power over the vomiting of children than of adults.

5. It often removes or lessens the vomiting of whooping-cough when this is produced by the violence of the cough, although it may in no way lessen the severity of the cough. Cases occur of vomiting from this cause, which are quite unaffected by ipecacuanha, but which immediately yield to alum. (See Alum.)

6. There occurs a species of vomiting after meals, in which there is no nausea nor pain, or even discomfort, the food is merely rejected, partially and often very little digested. This complaint may last a considerable time, but in many instances is quickly stayed by ipecacuanha wine. Arsenic is a still better remedy in this disease.

Ipecacuanha, in the author's experience, proves of little use in the following forms of vomiting :—

1. Where, in children, the vomited matters are composed of hard and large lumps of curdled milk. Lime-water is the best remedy in such a case.

2. It is not very generally useful in that form of vomiting met with in young children, a few weeks' or months' old, with whom the milk is almost immediately rejected after it is swallowed, and with considerable force, perhaps through both the nose and mouth. The milk may be curdled or not. At the post-mortem examination nothing may be discovered to explain this

fatal form of vomiting, but sometimes the mucous membrane of the stomach is extremely soft and looks as if made of water arrowroot. This form of vomiting is best treated by small doses ($\frac{1}{3}$ grain) of grey powder, or of calomel ($\frac{1}{10}$ grain).

Ipecacuanha is sometimes able to check the vomiting from cancer of the stomach, and has succeeded where the more commonly used remedies have entirely failed.

It excites from the mucous coat of the intestines an increased production of mucus, and is in this way slightly purgative, and it is reputed to assist the action of other purgative medicines, as jalap. It is also stated that constipation, depending on great torpor of the intestines, may be relieved by taking a grain of powdered ipecacuanha each morning while fasting. The same treatment is able, it is said, to remove the dyspepsia which very frequently accompanies the above state, in which there is much depression of spirits, some flatulence and coldness of the extremities, and where the food lies on the stomach "like a heavy weight."

This drug, as is well known, is much used in dysentery, and, in many instances, with very great benefit.

It is recommended in the epidemic forms of the disease, and is especially indicated where there is much blood and but little slime in the stools, and when the evacuation is accompanied by great straining. In some epidemics, it succeeds most admirably, while in others it appears to be without effect. Large, even drachm doses of the powder are given, often without the production of either nausea or vomiting, and especially so if the patient remains quiet, and lies on his back. Should the first few doses excite sickness, on the continuance of the medicine this soon ceases.

The active principle of ipecacuanha, without doubt, enters the blood, and we have next to consider its action on the distant organs of the body.

It is frequently given as an expectorant, but by some people it is maintained the drug can only act in this way by exciting nausea. Others consider it can influence the mucous membrane

of the bronchial tract irrespective of producing any feeling of sickness.

This latter view is probably the correct one, when it is borne in mind the powerful effect in some persons of even minute quantities of this medicine on the bronchial tract, in whom the same dose does not produce any sickness.

As an expectorant this remedy, in the form of wine, is of almost constant use in bronchitis, where the expectoration is profuse and difficult to expel. It has been much praised in hay asthma, and also in whooping-cough.

It is also supposed to be a diaphoretic, and, of course, it can act thus when it excites nausea, but perhaps also without producing such effects.

It has been highly praised for its usefulness in hæmorrhages, and has been successful in epistaxis, bleeding from the lungs or womb, and the flooding after delivery. By some of its advocates it has been given in drachm doses of the powder.

Trousseau recommended ipecacuanha as a useful remedy immediately after childbirth. It is to be continued for some days, and is stated to promote the natural functions of such times.

Ipecacuanha acts most surely as an emetic, when given in divided doses at short intervals. Thus five grains should be given in a little warm water every five or ten minutes.

VERATRUM VIRIDE.
VERATRUM ALBUM.
VERATRIA.

The preparations of these substances excite in the skin some inflammation, accompanied by a burning, stinging pain. In the form of ointment, veratria (20 to 40 grains to the ounce of lard) has been employed as a local application to remove the pain of neuralgias and of rheumatism, but it is inferior to aconitia, and hence is now but seldom used.

When snuffed into the nose the powder of veratrum excites violent sneezing.

In large doses the preparations of these substances produce nausea and vomiting, the nausea may be great and the vomiting prolonged.

On the intestines v. viride is said often to act as a purgative, but such is far from being frequently the case, even after doses large enough to cause great prostration and vomiting. Veratrum album is said to purge more frequently than v. viride.

In animals poisoned by veratrum there was no trace of inflammation of the intestines. The effects on the stomach and intestines, above mentioned, occur when the medicine is injected under the skin (Oulmont).

The active principles of these substances pass readily into the blood, as is sufficiently proved by the symptoms they occasion. There is produced by them dull, heavy, frontal headache, sometimes accompanied by shooting or stabbing pain over one or both brows. Similar pains are felt at the pit of the stomach, and at the region of the heart. The heart is greatly affected, for the pulse grows slow and weak, and may be reduced from 70 or 80 to 35 or 40 beats in the minute, and may, at the same time, be so weak as to be scarcely felt at the wrist. By the full action of the medicine the muscular strength is much prostrated, perhaps to such a degree that walking is impossible. The muscles may twitch and jerk spasmodically. This substance has the same effect on birds, and in America is sometimes used to destroy these animals. It makes them too weak to fly, and thus they are easily caught, but if left alone the effects of the drug pass off and they escape again. With this great prostration the surface is bedewed with a clammy sweat, the features are pinched, and there may be complete blindness and deafness, but delirium is rare. Dangerous as these symptoms appear, if the drug be discontinued they very speedily cease. Dull, aching pains, made worse by movement, have occurred in some observers, and also tonic and atonic contractions of the muscles, especially of the face and extremities. These twitchings are sometimes violent.

This remedy has been compared, on the one hand, to digitalis, and, on the other, to aconite. It has been asserted, like digi-

talis, to strengthen at first the contractions of the heart, and only to weaken them when the dose is excessive. It is very doubtful if digitalis has such an action as this, and veratrum appears in its properties to be more allied to aconite.

Kölliker, who experimented with v. album, has shown this substance acts directly on the muscles, paralysing them and tetanizing them, and does not influence them through the nervous system.

Veratrum viride has been employed in the following diseases:—The convulsions of children, chorea, typhoid fever, scarlet fever, measles, pneumonia, and pleurisy. In the treatment of these two latter affections, it has been taught by some veratrum is only useful in the sthenic forms, and then acts like tartar emetic or aconite. Other authorities, however, especially state this remedy is most useful when there is asthenia.

In pneumonia this remedy has been especially praised, and the cases published—and they are numerous—support these assertions. Out of 40 cases published by Dr. Kieman, five died, making a percentage of 12·5, but some of these cases were in a desperate condition before they were treated, and thus the percentage is probably higher than it would have been, had this medicine been employed at the beginning of the attack.

Dr. Drasche has recorded 73 cases, and, from his experience, he speaks very highly of this remedy. The pulse was greatly lessened, and the temperature lowered by 1 to 3° C. (Veratrum has been said to lower the temperature in health, but Dr. Squarey's observations on persons in University College Hospital have shown that this is not the case.) The breathing was made quieter, and the expectoration altered in character; it was made scantier and of a light yellow colour. The progress of the disease was not arrested, but became slower.

The patients were also much quieted and made more comfortable by this treatment. This observer also states the medicine makes the resolution of the lung slower, and sometimes produces vomiting of watery grass-green fluid, and occasionally diarrhœa. He also states if the remedy was discontinued before the disease declines, the pulse immediately rises again. The experience of

others, though in favour of this treatment, has not been so successful as above stated, and indeed it will at once be seen how very difficult it is to ascertain that the effects which are above described, were altogether due to the veratrum. The experience of others is that this drug reduces the pulse, but often only temporarily, and must, if these effects are to be continued, be given in increasing doses. Further, while it is admitted the temperature is reduced, this reduction does not reach the amount stated by Drasche, neither, it is stated, is the inflammation checked or shortened.

Typhoid fever, it is asserted, may be well treated by veratrum.

Oulmont has pointed out that the alkaloid veratria does not produce the effects on the body which have been described, and hence these must be owing to some other constituent of the plant; and the tincture, not the alkaloid, must be used.

In the treatment of the above diseases it is better to give small doses, as one or two minims every hour, rather than larger ones at longer intervals; as has been already said, in order to keep the pulse reduced, the medicine must be gradually increased, or otherwise in some cases it will suddenly rise to a great frequency, but may be in a few hours again reduced by a small increase of the dose.

Veratrum is said to be able to remove the pain of acute rheumatism, and of neuralgia, and to be useful in the former disease by controlling and shortening the fever. It is also said to be of service in sciatica and lumbago, and to be able to remove the "congestive headache," which occurs at the menstrual period.

Veratrum album has been used with success in the vomiting and purging of summer diarrhœa.

COLCHICUM.

Colchicum affects the structures and functions of the body in a manner very similar to veratrum, and yet in the treatment of disease the latter cannot be substituted for the former.

When applied to the skin strong preparations of colchicum are irritating and excite redness, pricking, and smarting, and when the powder of the corm is sniffed up the nose it excites sneezing and watery discharge from the eyes and nose.

Colchicum has an acrid taste, and produces much irritation of the fauces, and an increase of saliva, which is sufficient in some cases to be termed salivation.

On the stomach and intestines colchicum is an irritant, and produces its effects on these parts whether the medicine is swallowed or injected into the veins.

After small doses, continued for some time, there is produced a coated tongue with disagreeable taste. At the same time the appetite is impaired, and there is more or less thirst, with pain at the epigastrium, rumblings of the stomach, and looseness of the bowels.

Should vomiting occur, the ejected matters are bilious, or composed of mucus, and they may after a large dose contain blood. The stools are soft, or even liquid, and of a high colour, but after a large or poisonous quantity these are at first of the character just mentioned, but afterwards become dysenteric, consisting of slime and blood. There is then much straining with cutting pains in the belly.

Colchicum is rarely used to affect diseases of the alimentary canal. It has been employed as a cholagogue, and also, it is said, with success in cholera.

By some persons it is considered this medicine does most good in both gout and rheumatism, when it purges. By others this is held not only to be unnecessary, but injurious. There is no doubt, in gout, all that is desired of colchicum may be obtained from it without purging.

Colchicum quickly enters the blood, and after rather considerable quantities, soon excites warmth at the stomach, with a glow and outbreak of perspiration of the whole surface of the body, with throbbing of the vessels. The pulse is reduced in frequency and also in force.

In poisoning by this plant, or its preparations, there is noticed very great prostration, sometimes pain in the head. The features

are pinched, the skin perspiring and clammy, the pulse is quick, small, weak, or intermittent, and there is not unfrequently strong muscular twitchings, accompanied by pain. Pains have been felt in all the extremities, and Dr. Henderson narrates a case in which these were experienced in most of the joints.

After quantities sufficient to produce the symptoms just detailed, the stomach and intestines are found much congested and inflamed.

Colchicum is said to cause pain in the urinary tract, and also smarting on micturition. It is reputed to be diuretic, and to cause even in healthy persons a large quantity of urinary water, and uric acid, to be secreted. These statements have not been confirmed by either Böcker or Garrod, who show that colchicum lessens, if anything, the excretion of water urea and uric acid of the urine.

It is convenient at this place to speak of the influence of colchicum on gout. To Dr. Garrod the profession is indebted for an exact knowledge of this disease. This philosophical observer has shown that in gout there is a retention, with, possibly, an increased formation of uric acid in the system.

In the urine of patients afflicted with this disease very little, or even, in some cases, no uric acid can be obtained, while plenty can be detected in their blood. The urates thus circulating through the tissues are deposited in different parts of the body, and in the act of being so, excite active and painful inflammation.

Colchicum, it is well known, produces very speedy relief from the pain, inflammation and fever of this complaint, and such being the effect of this remedy, it is important to learn if the results are accomplished by the colchicum separating the uric acid from the system through the kidneys, and thence removing the circumstance on which the gout immediately depends. Dr. Garrod has clearly shown that colchicum has no power to increase in gouty people the elimination of uric acid.

The medicine must, therefore, possess a power to control gouty inflammation without in any way affecting the condition on which the inflammation in the first instance depends. It is

thus merely palliative, and removes for the time the sufferings of the patient, but in no way protects him from their return. Such, indeed, experience has abundantly proved to be true. For it is on all hands accepted that colchicum in no way prevents a return of the complaint; nay, many who suffer from it are of opinion that, while the medicine removes altogether an existing attack, it makes the return of another more certain and speedy. It is, therefore, with such people a common advice to those similarly affected, to abstain from colchicum.

The effect of colchicum on the gouty inflammation is very rapid, for after a large dose of the medicine (a drachm of the wine) is taken, the severest pain is often removed in the course of one or two hours, and very speedily the swelling and heat subside.

But while the pain is thus quickly subdued, the temperature of the body falls but very little during that day, but on the following morning there is generally witnessed a considerable decline, and often a return to the temperature of health. Should this be deferred for a longer time, on the second day after the use of the colchicum a continuous fall of the temperature is noticed, till all fever disappears. This effect of colchicum has been proved by some observations conducted by Dr. Rickards and the author.

Before closing the remarks on the influence of colchicum on gout, it is necessary to mention the two methods of employing it. By some small doses are given, by others large ones—as much as a drachm of the wine at a time. The latter method sometimes produces sickness, diarrhœa, and great temporary weakness, all of which circumstances are avoided by the employment of smaller doses. By large ones, the pain is at once extinguished, and, as we have seen, very generally, on the following morning the temperature has returned, or nearly so, to its natural degree. With small doses such results may only be accomplished in several days.

The remedy sometimes is of use in the treatment of various diseases occurring in gouty persons. Thus, bronchitis, asthma, dyspepsia, &c., in such people are often most quickly removed by a

recourse to colchicum. This drug has been much praised on account of its influence on rheumatism. Some authorities believe it to be useful in the synovial, others in the fibrous form. It has yet to be established that it is useful in any species of the disease.

PODOPHYLLUM.

This is a remedy used chiefly as a purgative. It has been further asserted, on high authority, to increase the quantity of bile poured into the intestines, a statement, however, denied by several observers. Those who believe in this action of podophylline are not united as to the way in which this is accomplished; for some think the medicine increases the secretion of the liver, while others assert it stimulates the gall bladder to contract, and expels its contents into the intestines.

This subject has been investigated by Dr. Anstie, who experimented with dogs and rats.

He employed a solution of podophylline in alcohol, some of which he injected into the peritoneal cavity. There first occurred symptoms attributable to the alcohol. These soon passed off, and in a variable time—sometimes in two, at others not till ten hours—there occurred vomiting and purging. The discharge from the bowels was repeated, and sometimes almost incessant.

Dr. Anstie, in most instances, omits to mention the character of the stools, but he states of one observation, the stools were of glairy mucus; of two, they were highly coloured with what looked like bile. Blood also was not unfrequently voided, and the animals appeared to suffer great pain, and in a little time became weak and prostrate.

At the examination after death, the œsophagus was found healthy, and the stomach somewhat congested, due, Dr. Anstie suggests, to the violent vomiting. The small intestines were violently inflamed, and especially so at the lower part of the duodenum, which in some cases was extensively ulcerated. The large intestines were to a slight extent inflamed. The peritoneum

was not at all so (although the injection was made into this cavity), not even around some granules of podophylline, which remained unabsorbed on the serous membrane. The contents of the intestines were liquid.

In all the cases in which any mention is made of the effects on the heart and respiration, the movements of the latter ceased before those of the former.

From these experiments, it may be inferred podophylline is absorbed, and has an affinity for the intestines and especially for the duodenum.

This remedy did not alter the appearances of the liver, in Dr. Anstie's observations, and for this and other circumstances, which have been stated, Dr. Anstie concludes it has no especial action on this organ. The author scarcely thinks the experiments referred to support this conclusion, as they are inconclusive as to the amount of bile poured into the intestinal canal; indeed, it is probably impossible to learn what quantity of bile is secreted by experiments conducted in the way Dr. Anstie's were. He judged by the character of the motions and of the contents of the stomach.

But assuming podophylline to be unable to increase the secretion of bile in health, it by no means follows it is unable to do so in disease. It is quite conceivable podophylline and other remedies may be able to remove diseases of the liver which arrested the secretion of bile, when these remedies would in such diseases be cholagogues, and such cholagogues as should be most desired, for surely it is far better to promote the secretion of bile by restoring the liver to health than by a medicine (if such exist) which shall be able to compel a diseased liver to secrete. In the one case we remove the hindrance to the secretion of the bile; in the other, if it be possible, we compel the secretion in spite of this.

The experience of those who have used this drug largely, is strongly in favour of its cholagogue properties in some diseases.

The author's experience of this medicine leads him to a similar conclusion, and partly on account of the influence of this

drug on the motions of children with the following symptoms :— During the early months of life, and especially after a previous attack of diarrhœa, obstinate constipation may occur, and the motions be very hard, crumble when broken, and of a clay colour, often mottled with green. Sometimes the passage of such through the sphincter of the rectum occasions great pain to the child, who, consequently, screams at each evacuation. There may be at the same time much flatulent distension of the belly, which excites frequent colic, and this, in its turn, makes the child cry, often without any cessation.

Such a condition of the motions is almost always witnessed in children of one or two months' old, who are fed instead of suckled. In this state of health the author knows nothing so effectual in bringing back the proper yellow colour to the motions with also a proper consistence, as podophylline. He directs a grain of the resin to be dissolved in a drachm of alcohol, and of this one or two drops are given to the child on a lump of sugar, twice or three times in the day. The quantity administered must be regulated by the obstinacy of the bowels, which should be kept open once or twice a day. Under this treatment, often immediately the motions become natural, the distension of the belly by wind ceases, and the child is quieted and its health improved. As the colour is restored to the motions, it is probable the colouring matter of the belly is secreted in increased quantity by the action of the podophylline.

A similar way of administering this remedy may be adopted with adults, to whom can be given five or six drops of the above solution twice or three times a day, or every hour, if it is urgently needed, to obtain relief from the bowels. By such an exhibition of the medicine, the fullest effects are obtained by the smallest possible dose, while at the same time the uncomfortable griping which commonly follows the ordinary employment of the drug is avoided.

This drug, it has been asserted by some American physicians, may be used instead of mercury. In the disease of children, just described, the author has very generally found mercurials to fail, or to act with only partial success.

Resin of podophylline, dissolved in alcohol, has been employed in America as a local irritant.

Podophylline is an uncertain purgative, and very liable to gripe, and is liable, especially with children, to produce, when given in too large quantities, slimy and bloody stools. Hence with children, as it is of uncertain action, it should at first be given in small quantities, which, if insufficient, must be cautiously increased.

STAPHISAGRIA.

This seed, made into an ointment, is employed only as an external application, to destroy the lice which infest the bodies of many dirty people. For such a purpose it is probably superior to all other applications, not excluding mercury ointments, for with these latter there is always some danger that enough may be absorbed to salivate or in other ways injure the health.

Formerly the seeds were ground to a meal, and this was mixed with a simple ointment. But as the meal was always very coarse, on account of the large quantity of oil the seeds contain, the ointment thus made was gritty, and uncomfortable as an application. This inconvenience has been remedied by a plan suggested by Mr. Squire, who says, "finding that this meal contained a certain amount of oily matter, the author (Mr. Squire) had the oil removed from a small quantity of the meal by percolation with ether, and found that the meal was then capable of being reduced into a fine powder." He employed this powder in several cases of phthiriasis (louse disease), and found it quite inert. "On inquiring what proportion of oil had been extracted from the meal, he found that it amounted to as much as one-half (by weight) of the meal. On making trial of the oil, suitably diluted with olive oil, he found it as efficient as any remedy he has ever tried against phthiriasis. A cheap way of preparing the oil for application, is to digest the seeds in melted lard, and strain while hot. The filtrate is an ointment of the seeds of

Stavesacre. Two drachms of the bruised seeds should be used to an ounce of lard."

ACTÆA RACEMOSA.

This medicine is much more extensively used in America than in England. In the former country it has been for centuries employed by the Indians and settlers, for chorea and many uterine diseases, and also in confinement to assist the uterus to expel the child. Those most experienced in the employment of this drug speak loudly in its praise.

Although not used as a local application to the skin, it is asserted by some, when given to persons with the small-pox, to prevent the pitting of their skin.

In simple and malignant sore throat, and in that troublesome chronic and obstinate disease, in which the mucous membrane of the pharynx is quite dry, and spotted over with inspissated mucus, actæa is said to be useful.

This remedy is not, as far as the author knows, used for its effects on the stomach or intestines.

After its absorption into the blood, it depresses both the force and frequency of the pulse, and has been compared by some to aconite, and by them used for similar purposes. It has thus been employed, it is said, with much success, in influenzas and catarrhs, where there is headache, stiffness of the muscles, with dull, aching pain in the bones, and a feeling as if the body had been beaten all over.

Preparations of this plant have been much used in acute rheumatism, the pain of which disease is said to be speedily removed by them. They are also highly spoken of as remedies for lumbago and sciatica, and the first of these is said to be more speedily subdued by actæa than by any other remedy.

The author has given it a patient trial in these diseases, and also in those cases of chronic rheumatism where one part of a tendon, muscle, or articulation in the back or elsewhere, is exquisitely painful on movement, and where there is great stiffness

of the muscles of the back, loins, and hips, but unfortunately with very little if any success.

In his hands, however, certain forms of chronic rheumatism have been very satisfactorily treated by this remedy, as, for instance, rheumatoid arthritis, where the joints are enlarged and much stiffened. It does not, however, suit all cases alike, but best those in which the pains are worse at night, and the remedy may be considered especially indicated when the disease can be traced to some previous derangement of the uterus, as sudden suppression of the menses, an abortion, a painful and difficult confinement, or to the disappearance of the catamenia at the natural term of life. It may be the joints are not enlarged, and the pains may flit from joint to joint instead of remaining steadily in one place. Painful cramps of the legs sometimes torment such patients. These sufferings are aggravated by wet and cold weather, and by certain winds. On account of the pain the sleep is much broken.

Such persons may very generally have afforded them very considerable relief from pain and freedom from the cramps, if the actæa is used, while, at the same time, by calming the pain (but also independently of this), there is insured to them quiet and refreshing sleep. But while the indications just named are for the most part true, it must be confessed that chronic rheumatism and rheumatoid arthritis in men are sometimes relieved by this remedy, which may be also of service when the pains are most complained of in the day.

Again, cases like the following are sometimes astonishingly benefited by the medicine.

The patient is first troubled with pains, apparently rheumatic, in most of the joints, but without any degree of fever or swelling of the painful parts. Soon the disease seats itself in one part, such as the wrist and hand; the tissues here become much thickened, and the bones of the wrist enlarged, till after a time all movement is lost, and the member is made useless. The pain may be made better by warmth, and almost cease at night. Such a disease presents many of the characters of gonorrhœal rheumatism, but there is no history of gonorrhœa. These patients the author

has seen almost instantly relieved of their pains by actæa, while speedily the joints have become supple and useful again, and this after iodide of potassium and other remedies have been fairly tried in vain.

It is said chorea, whether rheumatic or otherwise, yields to actæa. This assertion the author has put to the test of experience, and has found the remedy fail altogether when there was no history of rheumatism, but apparently sometimes succeed when such a cause for the chorea could be ascertained. It is greatly inferior to arsenic.

It is on the generative organs of the female this plant operates most powerfully.

Its action on the uterus is very similar to that of ergot. Thus the contractions of the parturient uterus are made more powerful by it, and hence it hastens the expulsion of the child. Ergot differs, however, from actæa in producing a constant and continuous contraction of the uterus, while the natural movements of this organ are merely strengthened, but not prolonged by actæa. The latter remedy, therefore, endangers much less the life of the child, and the soft structures of the mother through which this passes on its way into the world.

Actæa is said to be useful in preventing after-pains, and to expel after delivery the placenta from the cavity of the uterus, but as the contractions of ergot are more persistent this last-named remedy is for such purposes to be preferred. It has been recommended in amenorrhœa, dysmenorrhœa, and in menorrhagia. This last disease it can certainly arrest, although it appears to be in this property inferior to the bromide of potassium.

Again, when the menses, from any cause as cold, shock, mental emotion, are suddenly checked, or when, from similar circumstances, the lochia is suppressed, most distressing symptoms are apt to occur. There is more or less severe pain in the head, in the back, and down the legs. The muscles may be stiff and sore, and the uterus be afflicted with bearing-down pains. These symptoms, it is said, may be removed, and the natural secretion restored if actæa racemosa be employed.

The same remedy has been used to prevent miscarriages in irritable uterus and prolapsus uteri.

Headache is a common and distressing symptom with nervous hysterical women, and especially so at the menstrual period, or when this secretion is too frequent and too profuse, or when it comes to its natural end. Such headaches may often be removed by the employment of actæa.

The plurodynia dependent on uterine derangements is also enumerated among the troublesome complaints over which actæa prevails.

During pregnancy and after confinement women sometimes suffer from great mental disturbance, which may almost reach madness, when actæa is said (by Sir J. Simpson) to be highly beneficial (see Bromide of Potassium). It is thus seen that those maladies which may be traced to the condition of the uterine organs are for the most part amenable to the medicine we are treating of.

Actæa has been given to relieve the headache of students and those worn out by fatigue. The tincture made of 4oz. of the plant to a pint of spirit is the form in which the medicine is generally employed. Of this five minims may be given every hour, or fifteen to thirty three times a day.

ACONITE AND ITS PREPARATIONS.

Of all the drugs we possess, there are certainly none more valuable than aconite. Its virtues by most persons are only beginning to be appreciated, but it is not difficult to foresee that in a short time it will be most extensively employed in the diseases immediately to be noticed.

As external applications, the liniment or ointment is used to relieve pain. They appear to possess power over pain of different kinds. In the neuralgias of the brow or face these applications are sometimes of the greatest use, and often relieve, either permanently or temporarily, the distressing pain of these com-

plaints. But while in many instances their effects are immediate and permanent, yet it must be confessed that in the majority of cases the pain is unaffected. Neither can we, with our present knowledge, predict with any certainty the cases in which the application will be useful, or those in which it will fail. This much, however, is ascertained, that those neuralgias which depend on decayed teeth or diseased bone, or on tumours pressing on the nerves, are beyond the control of aconite. But these are not the only forms of neuralgia over which aconite cannot prevail. No doubt in some instances the failure can be explained by the badness of the preparation; but even when this is excellent, it is not uncommon for the pain to remain unabated after the application. As, however, no harm can possibly follow their employment, they should always be tried, and if unsuccessful, then recourse can be had to other modes of treatment. If aconite succeeds at all, it will succeed at once, and hence, if no relief is speedily obtained, it is useless to continue its employment. The preparation should be sufficiently strong to produce decided numbness and tingling in the skin over which it is rubbed; and, where of service, these sensations replace the pain, which does not return when the effects of the aconite have worn off.

The ointment and liniment should be applied with friction, which very greatly heightens their activity. Of the ointment, a piece the size of a pea or bean should be rubbed into the skin till it has disappeared. Care should be taken while using these powerful and poisonous applications that they are not rubbed into wounds or cracks of the skin, nor brought into contact with absorbent tissues, such as mucous membranes and the conjunctiva of the eye. Spinal irritation and intercostal neuralgia may, in many instances, be removed by aconite ointment, and sciatica sometimes yields to the same remedy. The former complaints are better treated by the belladonna preparations.

When employed internally, the following sensations are experienced, the graver appearances and symptoms occurring only when a considerable dose has been taken. There is first a feeling of warmth at the pit of the stomach, with sometimes nausea and vomiting. The feeling of warmth spreads over the body,

and there is soon perceived tingling of the lips and tongue and adjoining parts; the uvula, with the tongue, feels as if it were swollen, and too large for the mouth, and deglutition is frequent. If the dose has been a large one, the tingling and numbness are felt in the tips of the fingers, and thence spread over the whole body, and are accompanied by diminished sensibility and some muscular weakness, which, if the dose is a considerable one, becomes extreme, and is one of the most prominent and important symptoms of the drug.

On the circulation and organs of respiration its action is most noteworthy. With moderate doses the number of the heart's beats are much lessened, and may sink to 40 or 36 in the minute; but after a larger and dangerous dose, the pulse rises in frequency, and may become irregular, and with some persons such irregularity follows even a small quantity of the medicine. Whether the frequency be increased or lessened, the pulse always loses strength, and hence the circulation is retarded. The effects on respiration are very similar. By moderate doses the breathing grows slower; but after large and poisonous quantities it is often short and hurried.

During the administration of aconite, cutting pains are often complained of in the joints and other parts of the body, and there sometimes breaks out on the skin an eruption of itching vesicles. Delirium occurs in some cases, but often after fatal doses the mind remains clear to the last. In some cases which have ended in death there has been found blindness, and deafness, with loss of speech.

When death is produced by this drug, the muscular weakness is extreme, and frequent faintings occur. Death from aconite appears to be due to syncope. On account of its power to diminish sensibility, aconite has been used internally in various painful diseases; but other remedies have, for the most part, superseded it for the relief of pain.

It is on account of its power to control inflammation and subdue the accompanying fever that aconite is to be the most esteemed. The power of this drug over inflammation is little less than marvellous. It can sometimes at once cut short the

inflammation. It does not remove the products of inflammation when these are formed, but by controlling the disease, it prevents the formation of these, and so saves the tissues from further injury. It is therefore in the early stage of inflammation that the good effects of this plant are most conspicuous; still, although the disease may have progressed to some extent, and have injured the organs by the formation of new and diseased products, while the inflammation is extending aconite does good. It is useful wherever there is acute inflammation of any tissues of the body. The good it accomplishes can be shown both by the amelioration of the symptoms, and, still better, by the changes it effects in the inflamed tissues when these are visible, as in pharyngitis, tonsillitis, &c.

As might be expected, the results of aconite are most apparent when the inflammation is not extensive, or not very severe, as in the catarrh of children, or in tonsillitis, or in acute sore throat. In these comparatively mild diseases, especially if the aconite be given in the earliest stage of the inflammation, when the chill is still on the patient, the following consequences will very generally be witnessed:—In a few hours the skin, which before was dry, hot, and burning, becomes comfortably moist; and, in a little time longer, it is bathed in a profuse perspiration, which may be so great that drops of sweat run down the face and chest. With this appearance of sweat many of the distressing sensations, such as the restlessness, chilliness, or heat and dryness of the skin, are removed. At the same time, the quickened pulse is much reduced in frequency, and in a period of twenty-four to forty-eight hours it and the temperature have reached their natural state. It is rare that a quinsy or sore throat, if caught at the commencement, cannot be disposed of in twenty-four to forty-eight hours. The sweating may continue for a few days after the decline of the fever on slight provocations; but it then ceases.

The appearance of the inflamed part also exhibits, in a striking degree, the beneficial effects of the drug. Thus large, livid, red, glazed, and dry tonsils may often, in twenty-four hours, have their appearance completely altered. If the medicine has been given

before much lymph has been formed in these organs, in the time named the swelling and most of the redness will have disappeared, and the mucous membrane will have that look which proves the acute inflammation to have subsided, namely, it has become moist, and is bathed with mucus or pus. If just at this stage some strong astringent, such as glycerine of tannin, be applied, most of the remaining diseased appearance and the pain, if it continues, will be removed. Such are the visible effects of aconite on inflamed tonsils, &c.

These statements are not exaggerations; but the simple truth, as may be witnessed by those who will employ the aconite in the way to be immediately mentioned.

Its effects on catarrhal croup are as conspicuous. In a few hours the urgent dyspnœa is removed, and in a short time longer the fever is subdued. Severe colds, in which there is much chilliness, with great aching of the limbs, with a hot, dry skin, and quick pulse, may be equally well treated by aconite. So, indeed, may all the slighter forms of inflammation.

The effects of this valuable drug, though not so rapid, are equally important on pneumonia, pleurisy, and the graver inflammations. These diseases may be considerably curtailed, and made much milder if aconite is employed.

When in pericarditis the heart throbs violently, and thus produces extreme pain, aconite will quiet the heart, and speedily ease the pain.

Its influence on inflammation has been ascribed by most observers to its power over the heart; and, as they truly point out, the remedy is found to be of most use in the sthenic forms of the disease; and where there is great weakness, and the heart beats feebly, unless care is taken, it may do harm. The method of employing the drug has much to do with its success. As already said, it should, where possible, be given at the very beginning of the disease. Every hour is of importance; the use of the medicine should never be delayed. Of the tincture, half a drop, or a drop in a teaspoonful of water, should be given every ten minutes or quarter of an hour for two hours and afterwards be continued every hour. If there be much prostration, and

the pulse be feeble and weak, a still smaller dose will best be given.

It is not inappropriate to mention here what signal service the thermometer may render in enabling us to decide whether aconite should be given or not. When called to see a patient, and when the symptoms and physical signs are not sufficiently developed to decide whether an acute inflammation of some deep-seated part has set in or not, this instrument will often decide the doubt. No acute inflammation can exist without preternatural heat of the body. Hence, if in a doubtful case the temperature, after a careful investigation, be found natural, the case is not one for aconite; while, on the other hand, if the symptoms, although doubtful, indicate an inflammation, the presence of an increased heat of the body will very considerably add to the probability of its existence, and will so indicate the advisability of employing aconite.

Another instance may be mentioned. After scarlet fever, as is well known, acute inflammation of the kidneys is very liable to occur. This would at once be indicated by a rise in the temperature of the body. It is therefore desirable to direct the friends of such patients to observe, night and morning, the temperature; and if this should rise beyond limits of health, they should at once commence the administration of aconite, and not allow some hours to elapse before the patient can be seen by the medical attendant. It is true the fever may depend on some other complaint than inflammation of the kidney; but it will even then probably be inflammatory in character, as from gastric catarrh, over-feeding, and the like, in all which cases the aconite will be equally efficacious.

Whether aconite is of use in the fever of acute specific diseases, as scarlet fever, measles, &c., is not so certain as its power over inflammation. But although there may be some doubt whether this remedy can lessen the severity of the fever of the acute specific diseases, there is no doubt it can control and subdue the inflammatory affections which often accompany them, and which may by their severity endanger life. Thus, aconite will moderate the inflammation of the throat in scarlet fever, and the

catarrh and bronchitis in measles, and in this indirect manner lessen the height of the fever. It appears to be unable to shorten the course of these acute specific diseases. In the treatment both of simple inflammations and acute specific diseases, aconite may be appropriately administered in conjunction with some other remedy which may be indicated.

The treatment which has just been described will be found of value in erysipelas, in which disease belladonna may also with advantage be given. In the treatment of acute rheumatism aconite has been much praised, and from the eminence of the authorities by which it has been recommended there can be no doubt of its usefulness. Still, in this complaint its good services are not so apparent as in acute inflammation. This disease has no regular course or duration, but may, untreated, last only a few days, or many months. It is difficult, therefore, to decide whether the speedy decline of the fever in some cases is a natural decline, or has been accomplished by the aconite. It is certainly ineffectual in many cases, which appear to run their course uncontrolled by this remedy. So that it is still required to determine in what class of cases it is useful, and in what cases it is without effect. In one respect it often appears to be of service, namely, in removing the pain from inflamed and swollen joints.

Gouty pains are said by some to yield to this remedy, and it has in many instances, apparently with good results, been given to persons suffering from neuralgia.

The effect of this remedy on the heart has been mentioned. There it was shown to lessen the rapidity of the circulation. Aconite may thus be used in all cases where there is vascular excitement which it is desired to suppress, and also when it is desirable to diminish the force of the circulation. In fact, it may be given in precisely those cases which were formerly treated by bleeding.

This remedy may be employed with advantage when the menses are suddenly checked, as by cold, on account of its power to restore the flux, and so remove the distressing and peculiar symptoms which not unfrequently occur when such a disease is produced.

The "fluttering at the heart" of nervous persons, and also nervous palpitations generally yield to this remedy. Usually when such disturbances occur, more general treatment is required, but when the conditions causing the palpitation cannot be discovered or cannot be removed, then aconite may be usefully employed.

The acute stage of gonorrhœa may be well treated by a drop of the tincture of aconite each hour, and the same treatment will often remove chordee.

DIGITALIS AND ITS PREPARATIONS.

Large doses of these preparations excite nausea, vomiting, and diarrhœa; the matters voided both ways, being of a grass-green colour. This colour is produced by the action of the gastric juice on some constituent of the digitalis. These symptoms and appearances may follow even a medicinal dose.

The digitaline passes unchanged, and with readiness from the intestines into the blood, for the same phenomena ensue whether the alkaloid be injected into the veins, or is swallowed.

The action of these preparations on the heart is the most noteworthy, and our knowledge of its influence on this organ, either healthy or diseased, is daily becoming more exact.

Drs. Fagge and Stephenson have published some interesting and important investigations concerning the influence of digitalis on the frog.

"Its effect on the frog is the production of irregularity of the heart's action, followed by complete stoppage of the pulsations, the ventricle remaining rigidly contracted and perfectly pale after it has ceased to beat, the muscular power of the animal at the time being unimpaired and persisting as long as in frogs, in which the circulation has been stopped by other means, such as ligature of the heart. The irregularity of the heart's action which precedes its stoppage, under the influence of the poison, is peculiar. The rhythm is but little altered, and the beats are

not necessarily diminished in number, as has been supposed. Sometimes, however, the ventricle makes only one pulsation for two of the auricles, the number of its contractions being therefore lessened by one half." (There is nothing peculiar in this.) "More frequently, the irregularity consists in one or more portions of the ventricle (especially the apex) becoming rigid, white, and contracted, while the remainder of the organ continues to dilate regularly. When the yielding portions are small, a peculiar appearance as if the wall of the ventricle formed crimson pouches or protrusions is produced."*

The action of the digitalis in these experiments was certainly not to weaken, but to strengthen the heart's contractions, and at last to tetanize this organ.

At the same time the contractions were made peculiar and irregular.

Two other experimenters, Eulenberg and Ehrenhaus, have ascertained the influence of solutions of digitaline applied directly to the heart of the frog after it has been separated from the body.

With a solution of digitaline composed of $\frac{1}{4}$ grain of the alkaloid to the ounce of water, the still pulsating heart, when partially submerged in it, had its contractions increased in force, but every now and then there occurred a pause in its beatings.

With a still weaker solution (gr. i to ℥viii) the same occurrences were observed. The pulsations grew fewer and fewer, while the duration of each contraction was proportionately lengthened. The heart continued to pulsate for $2\frac{1}{2}$ hours.

From these investigations, it appears that digitaline strengthens the contractions of the heart, and prolongs the systole, while it does not at all shorten the time the heart usually continues to contract after its removal from the body.

Dr. Nunneley, of York, has made numerous observations on the action of digitaline on frogs. The following is a summary of what he has observed. The account is given in his own words:—

* These authorities point out that "Upas Antiar, Helleborus viridis, and perhaps other species of Helleborus, the Tanghinia venenifera, the dajaksch, the carroval, and scilla maritima influence the heart in the same way."

"The physiological action of digitaline on the heart of the frog would appear to be widely different from its therapeutical action on the dilated and weakened human heart in disease. In the former case the heart is thrown into violent and disorderly contractions, which quickly end in a cessation of movement.

"In the latter, clinical examination of the heart and pulse appear to show an increase of contractile power and a restoration of its regular performance.

"1. The first visible effects on the heart occurs a short time after the injection of a moderate dose under the skin of the frog, and consists in a diminished range of the heart's movements, whilst the organ itself appears somewhat shrunken. The most marked alteration, however, is a certain embarrassment and want of smoothness in the contractions, as if the separate muscular fibres acted with undue energy, but in an irregular manner, or as if there were a want of co-ordination in the contractions of the individual fibres.

"2. The heart does *not* contract with greater frequency after a dose of digitaline, and no change at all occurs in this respect until its action becomes embarrassed, when the frequency of pulsation is diminished, and does not again increase.

"3. The ventricular systole is lengthened, but it presents a very different appearance to the systole in health. The ventricle seems no longer to act as a single large muscle, but as if made up of numerous small ones, which contract energetically, but in an irregular and disorderly way, hence there are projecting bundles of contracted muscular fibres which give the ventricle a rough and uneven surface, and an irregular outline. During the diastole the ventricle does not everywhere assume a red colour, but one or more red spots appear as if the ventricle were so tightly compressed that only a small quantity of blood could enter it by chance. Sometimes a red spot is elevated a little above the general surface, forming a kind of pouch. These spots become smaller and smaller, until at last the ventricle is left very pale, strongly contracted, and motionless, while the auricles are distended with blood.

"4. The rhythm of the contraction of the three cavities is

generally little interfered with. Two contractions of the auricles sometimes occur to one of the ventricles, but often there are also two ventricular contractions, one of them being very slight and transient.

"5. Locally applied to the web of the frog's foot, no effect whatever is produced in the calibre of the small arteries, nor does any alteration in their size occur when it is injected under the skin, until the irregular and more or less persistent contractions of the ventricle diminish the blood stream to which the arteries then to some extent adapt themselves. The primary action of digitaline is thus on the heart.

"Sometimes after the injection of a dose under the skin, the frog has paroxysms of gasping movements, in which it remains perfectly still, leaning on its fore-paws, which are widely separated, and holding its head up, and opening its mouth widely. Whilst in this state, which lasts from about half a minute to a minute and a half, or more, the frog scarcely notices irritation of its skin, or shaking of the dish containing it, and the mucous membrane of the tongue and mouth are seen to be extremely pallid in consequence of the small quantity of blood sent from the heart. When the paroxysm has passed off the frog jumps about with energy. It is worthy of remark that whilst the embarrassment to the action of the heart is continuous, the gasping movements are paroxysmal, as in human beings where the cardiac dyspnœa occurs in fits, whilst the condition of the heart remains constant. The posture and appearance of the frog are chiefly noticeable, however, from the vivid picture they present of extreme and urgent dyspnœa."

It thus appears that all these experimenters in the main agree as to the action of digitalis on the frog's heart.

How this drug affects the healthy human heart has not yet been satisfactorily settled, as the statements of different authorities are on some points contradictory. All observers agree that under its influence the heart's beats are almost always very much reduced in frequency, and when very large and poisonous doses are used the pulse becomes weak, frequent, and intermittent. By some observers it has been maintained that the heart is first

quickened in its contractions, but this assertion is denied by others.

On the diseased heart digitalis often acts with conspicuous advantage. Where the heart beats feebly and irregularly, and when the pulse is quick, irregular, or intermittent, digitalis will almost always be found of service.

Its good effects are most apparent in cases of general dropsy, depending on a dilated heart, but the heart affection on which dropsy depends is not, however, always of the same kind.

The dilatation may be chiefly on the right side, or most marked on the left. If on the right side it may be owing to obstruction to the free passage of the blood, as in the lungs from emphysema and bronchitis, which obstruction causes the right ventricle to become engorged, and so distended that its valves are made incompetent, and tricuspid regurgitation, with its consequent dropsy, results. Or the dilatation and enfeeblement may be mainly, and sometimes entirely, limited to the cavities of the left side, and be due to aortic or mitral disease, or to both. Further, there by no means uncommonly occurs extreme dilatation (generally with a good deal of hypertrophy) of the left ventricle, with extensive dropsy, and a murmur, having the characters of a mitral regurgitant one, without the existence of any valvular incompetence of either this or the aortic valves. With all these forms of heart disease extreme general dropsy occurs, but it is in the highest degree important to recollect that digitalis is not equally capable of doing good in all these different diseases, and that a careful discrimination must be made, or the employment of this drug will lead very often to great disappointment to the practitioner, and it may be, harm to the patient. For digitalis, while able in some forms of heart disease to remove most of the symptoms, even when these are of the gravest character, can accomplish little, and it may be nothing, in the other forms.

It is now proposed to pass in review those kinds of heart disease which may be benefited by digitalis, and also those which are little, if at all, influenced for good by this medicine.

With a patient presenting the following symptoms and physical signs, digitalis will be found of eminent use. There is

present dropsy, which may be extensive. The breathing is much distressed, in the earlier stages of this disease only periodically, and is so especially at night, but when the disease is at its worst it is continuously bad, although it becomes paroxysmally worse. The patient cannot lie down in bed, and is perhaps obliged to sit up in a chair, the head leaning forward on the bed or some other support. The pulse is frequent, very feeble, fluttering and irregular. The urine very scanty, high coloured, and deposits copiously on cooling. The heart is seen and felt to beat over a too extensive area, and the chief impulse is sometimes at one spot of the chest, and sometimes at another. The impulse is undulating, and the beating very irregular and intermittent. The physical examination shows there is a great dilatation of the left side, with perhaps a not inconsiderable amount of hypertrophy.

There may perhaps be heard a murmur, having the character of one produced by mitral regurgitant disease.

A case presenting these symptoms and physical signs, will, very generally, respond quickly to digitalis, if given in the following way:—

In all treatment the object must be to obtain the greatest therapeutic effects from the smallest possible dose of medicine. This is particularly important with a powerful drug, like digitalis, for if, indeed, a large quantity be at once employed, it often appears to increase the embarrassment of the heart, and relief will only be obtained when the dose is diminished. And further, it is important not to give a larger quantity of the medicine than is necessary, as it is very possible the patient may require its use for a long period; for in such a case as described, after a time the patient becomes accustomed to the medicine and the dose, which at first did good, seems to have partially lost its effects, when a larger quantity is required, but which could only be given with the greatest caution, and even with some danger, if the maximum quantity had in the first instance been employed.*

* The importance of these remarks will be the greater, if it should prove, as has been asserted, that digitalis is a cumulative poison. It is further of importance to keep the dose of digitalis as small as possible, as sometimes

It is advisable to begin by using a drachm of the infusion twice, or not more than three times a day. In many instances this will be enough. The effects on the pulse, the urine, and dropsy, are to be carefully watched. Under the influence of this medicine, when it is in sufficient quantities and does good, the pulse grows much stronger, more regular, and much slower, till, in very many cases, all irregularity ceases, and it becomes natural in frequency and rhythm. At the same time the urine, which previously may have been not more than half a pint in the 24 hours, is increased to 1, 2, 4, or even 8 pints a day. With this increase, and in proportion to it, the dropsy diminishes till it disappears. Should the influence of the drug be small or unnoticeable, the quantity, in a few days, may be increased; but it must be remembered, the good effects of digitalis may not become apparent till three or four days have elapsed. If an increase of the infusion be required, then a drachm may be given every three or four hours, as the circumstances indicate, or one drachm may be given in the morning and two in the middle of the day, and two at night. Should the symptoms resist this additional dose, another increase must be made in a few days. It not uncommonly happens that a small dose at first admirably succeeds, and removes much of the dropsy, but fails to accomplish all that is desired; then an increase in the quantity of the medicine must gradually be made.

The cases which we are now treating of, require in most instances the free administration of alcoholic stimulants, and the best of these preparations is gin.

When a patient with the above-mentioned symptoms dies, there is found at the post-mortem, a great dilatation of the left ventricles, with very generally much true hypertrophy of its walls. Sometimes there is incompetence of the aortic or mitral valves, but by no means uncommonly both these sets of valves are healthy, although there has existed, during life, a murmur having the characters of a mitral one.

after it has been continued some time, it produces general convulsions, which generally end in death.

The digitalis will be found to be especially suited when there is much dilatation and hypertrophy of the left side, without any valvular disease, although a mitral murmur has been heard during life.

It is impossible in many cases to decide during life whether there is mitral regurgitant disease or not, and it has been stated by eminent authorities that when there is aortic disease, the digitalis is worse than useless, and will embarrass still further the heart, and increase the difficulty of breathing.

These latter precautions, the author believes, may be disregarded, and whenever there is dilatation of the heart, with a feeble, frequent, fluttering, and irregular pulse, the digitalis may be given with the confident expectation of relief.

Of the indications here enumerated, the irregularity of the pulse is the most important, and the one which most decidedly indicates digitalis.

The heart disease which has just been described, may exist with other disease of the right side, which may be sufficient to cause tricuspid regurgitation and jugular pulsation. Indeed, this combination is by no means an uncommon one, when the dropsy will be still greater, as there are two conditions present which will produce it, instead of only one. Still, in such a combination, if the disease on the left side be extensive, and that on which the dropsy mainly depends, the digitalis will be of service.

The disease just described is not unfrequently met with in an earlier stage, when the symptoms, though troublesome, are not yet very severe.

In this form it is not uncommonly seen in children, who have some time previous had rheumatic fever. In such patients the heart give evidence of great dilatation with hypertrophy of the left ventricle, and its action may be quite regular, or slightly irregular, but there occur frequent attacks of palpitation, accompanied by much oppression of the breathing. These attacks may be so frequent and severe as to prevent the patients assuming the horizontal position, and consequently they are obliged to sit propped up in bed by pillows. There is no dropsy, or this is slight and transient, appearing for a few days, and then leaving,

till for some reason the heart becomes more embarrassed again. All these symptoms may be removed, and the general well-being of the patient in consequence be very greatly improved by digitalis.

In other instances the general dropsy is produced in a different way. There is obstruction in the lungs, generally from bronchitis added to emphysema. This obstruction overloads the right side of the heart to distension, and the tricuspid valves become incompetent when tricuspid regurgitation with fulness and pulsation of the jugular veins, with general dropsy, is produced. When the obstruction in the lungs is slight, the digitalis appears to give strength to the heart to overcome this, but the effects of the digitalis in such a case are far less conspicuous than in the former instances, and if the bronchitis is very extensive, then the digitalis is without avail, unless the pulse is weak and irregular, when it will very generally restore order in the heart.

Cases of the following kind not uncommonly occur, which may be greatly benefited by digitalis:—

A patient (who has been perhaps troubled with slight palpitation of the heart for some years) on catching a cold, is attacked with bronchitis, and has, in consequence, the palpitations much increased. These palpitations in their turn excite severe paroxysms of dyspnœa. On examination the heart may appear healthy, or there may be only a slight mitral murmur. Such persons may have the palpitations removed from them, and the breathing made calm by digitalis.

This medicine, however, leaves the bronchitis untouched, except that by easing the breathing, it indirectly assists expectoration, and enables, by the same means, the patient to obtain refreshing sleep. In this indirect way digitalis may benefit the bronchitis, but the medicine here acts on the heart, and if with bronchitis there occurs much palpitation or irregularity of the pulse, this remedy is indicated.*

Before treating the paroxysmal dyspnœa which may be pre-

* If during the fit of palpitation the heart beats very violently, one or two drops of tr. of aconite, given every quarter of an hour, may succeed in quieting it better than digitalis.

sent with bronchitis, it is important to learn if the paroxysms are accompanied by, and depend on palpitation of the heart, for, if so, ordinary antispasmodics, as lobelia, chloroform, or ether will be without avail. Digitalis is the remedy required, and a drachm of the infusion taken twice or three times a day, is generally sufficient.

Functional palpitations, and those attacks of palpitation which occur with hypertrophy of the heart, may be relieved by small doses of digitalis. Here probably, even when the heart is hypertrophied,* the palpitations are owing to some temporary weakening which the digitalis prevents. It is certainly wrong to view the palpitations as the result of too much healthy action.

The form of the preparation has, the writer believes, much to do with the success of the drug. The infusion, fresh and well made, will generally give far better results than the tincture. Other forms of dropsy, local and general, are said to be amenable to digitalis. The evidence of its efficacy is best established in the dropsy which follows scarlet fever.

This medicine, in one or other of its preparations, has been employed in the treatment of acute inflammation. Mr. King, of Saxmundham, was of opinion that no good was done in inflammations, unless the dose was a large one. He gave as much as half an ounce to an ounce of the tincture. With such formidable doses, he asserted his power to subdue most inflammations, if attacked at their very commencement, and before the inflamed organ was disorganized. He administered a dose, and then waited 24 hours to watch the effects. If the pulse at the expiration of this time was not made much less frequent or irregular, he repeated it. He has given as much as two drachms of the tincture to a child of nine months' old.

Sometimes vomiting quickly follows these very large doses. Mr. King never, in the course of his extensive use of this drug in these large quantities, met with serious or dangerous symptoms due to the medicine. Aconite, it is believed, will be found far safer, and even superior, to these huge doses of digitalis in the treatment of acute inflammation.

* Aconite is very valuable in such cases.

Wunderlich recommends digitalis in typhoid fever, when the fever is high and the pulse quick, as is the case in the second week of the disease. According to this authority, the medicine can reduce in two or three days the temperature of the body by 2° or 3° Fah. The pulse also is slackened, it may be by 30 or 40 beats in the minute.

This remedy has been recommended in other fevers, and probably acts on them as on typhoid fever.

Epistaxis, hæmoptysis, and menorrhagia appear to be controlled by digitalis. In cases of menorrhagia, not connected with organic disease, this medicine is said to act with greater benefit than any other remedy, and that when organic disease gives rise to this form of bleeding, the action of the medicine is scarcely less manifest, although the advantage may be temporary. This effect of the digitalis is independent of the state of the circulation.

In such cases the infusion is the best preparation to use. Large doses of it may be required. Digitalis occasionally, although not commonly, causes great strangury, and the patient has an almost incessant desire to pass water, and does so with great and very painful straining, accompanied in women by much bearing-down pain.

Few remedies are more successful in arresting spermatorrhœa than a drachm or two drachms of infusion of digitalis, taken two or three times a day. The effects of the medicine may be admirably seconded by the free application of cold water to the testicles and perinæum. It is a useful practice in such cases to let the testicles hang in cold water night and morning, for five or ten minutes at a time.

The late Mr. Jones, of Jersey, excited considerable astonishment by the announcement of the good effects he obtained from very large doses of tincture of digitalis in the treatment of delirium tremens.

He recommended the medicine to be given as follows:—

Half an ounce of the tincture is to be administered every three hours till three doses have been taken, and then, if the excitement is not calmed, or sleep has been produced, two drachms more of the medicine are to be given every three or four hours.

Mr. Jones published a considerable number of successful cases in corroboration of his statement.

The following appears to have been established with regard to the medicine in delirium tremens :—

I. The medicine may be given, as has been directed, without danger.

II. That it very often does good. By its use in some cases refreshing, quieting sleep, is speedily produced, and even when less successful than this, it generally calms undue excitement.

III. That some cases appear to be uninfluenced by the drug.

If these statements be true, it remains to be seen what forms of the disease are best treated by digitalis.

There can be no doubt that some of the most asthenic cases in which death was confidently expected, on account of the great prostration of strength, have astonishingly rallied, and ultimately recovered by this treatment.

The evidence on this point is too strong to be disputed. Under the influence of the digitalis, the weak, rapid, and fluttering pulse has grown strong and steady, the skin comfortably moist and warm, while with the improvement in the circulation and state of the skin, the general state of the patient has mended.

On the other hand, it appears equally certain, that the sthenic form of the disease is also amenable to the influence of this drug.

The author has, in several instances, seen this disease yield speedily to these huge doses of digitalis; but on two occasions in which it was administered, the patients suddenly fell back dead, although, up to the moment of their death they had given no warning of this sudden and untoward termination. Whether the death in these instances was to be ascribed to the digitalis or to the disease, it is impossible to say; but it is well known delirium tremens when treated by other remedies, sometimes ends in this suddenly fatal way.

TOBACCO.

Of the external application of tobacco, little need be said. It is reputed to allay pain, when used as a poultice, and it is further asserted that an ointment made by boiling half an ounce of tobacco in eight ounces of lard, kept continually applied to the breast prevents its secretion of milk, and hence such an ointment has been used to arrest this secretion, when from any cause the mother is prevented suckling her child, and by this means an abscess of the breast may be averted.

The external application of tobacco to the abraded skin is not without danger, for this has, in some instances, been attended with fatal results.

When applied to the conjunctiva of the eye, tobacco excites active inflammation, and, as also when taken by the stomach, produces dilatation of the pupils, followed sometimes by contraction.

When introduced into the body in any quantity, it produces nausea and much sickness, with great muscular weakness, and tremblings, and faintness. The ideas are confused, the sight may be dimmed, the pulse is weak and feeble, and the surface is covered with a clammy perspiration. "Sir B. Brodie found that the infusion of tobacco, thrown into the rectum, often paralysed the heart, and caused death in a few minutes. But if the head of the animal was previously removed, and artificial respiration kept up, the heart remained unaffected, proving that tobacco disorders this organ through the medium of the nervous system." (Pereira.)

From the weakness and prostration which is caused, any spasm that exists is removed, and thus tobacco, given either by the mouth or used as a clyster, has been employed in colic of the intestines and in strangulated hernia, but its use in such diseases is now quite superseded by chloroform.

Tobacco-smoking produces in those unaccustomed to it many of the effects above enumerated. It excites an abundant secretion of saliva, and for this reason it has been thought by

some, tobacco-smoking must aid digestion. On the intestines tobacco-smoking acts as a slight purgative, and there is no doubt that a pipe or cigar smoked after breakfast, is sufficient to ensure in many people an easy and satisfactory relief of the bowels, and hence this practice may be advantageously adopted by persons who are troubled with habitual constipation.

Smoking in excess is, no doubt, a very harmful habit, as it disorders digestion, and greatly lessens the appetite, and incapacitates those addicted to this abuse for both mental and bodily occupation. There is also produced by it much restlessness at night, with disagreeable dreams. Chronic pharyngitis, with constant hawking, and also chronic dyspepsia, may in some instances be clearly traced to smoking in excess. The habit has also been said to produce amaurosis. The symptoms produced by smoking in excess soon cease when the habit is discontinued. The habitual smoker has generally a thickly-coated tongue. These evil consequences are much less marked if the tobacco is of good quality, and contains but little nicotine. It is a point of importance in the cultivation of tobacco to obtain in the plant much of the aromatic principles and but little nicotine.

The action of tobacco is especially expressed on the motor nerves and voluntary muscles, for it feebly paralyses the former, and acts much more decidedly on the latter, destroying their irritability.

It also paralyses the heart, but not by its direct action on the muscular substance, but probably by affecting the nervous centres which regulate its movements. Such appears to be the conclusion from Brodie's experiments, which have been already referred to. With frogs the result is somewhat different, for in these animals, after they are destroyed by tobacco, the heart continues to beat long after muscular contractility has disappeared from the voluntary muscles. With frogs, indeed, the nicotine appears to tetanize the heart, for when this organ has ceased to contract after death, from a mechanical cause, on the direct application to it of nicotine the pulsations recommence, and soon the heart becomes rigidly contracted—tetanized, in fact—and then, of course, the beating ceases again. Also, in birds and

mammals killed by chloroform, when the ventricles are immobile and dilated, and respond most imperfectly to stimuli, a drop of nicotine, directly applied, occasions immediately in the heart strong contractions, and causes the organ to respond energetically to mechanical and galvanic stimuli.

The mind appears to be unaffected by tobacco, but repeated faintings, as is well known, may be occasioned by it.

It appears generally to destroy life by paralysing the motor nerves of respiration, and thus producing asphyxia.

Nicotine has been highly praised by some in tetanus, and many cases are recorded which appear to show its usefulness in this very fatal disease. Mr. Curling considers it the best remedy for this disease. It is desirable to administer it either by the rectum or hypodermically, for when put into the mouth it very generally excites a very severe paroxysm, which not uncommonly is sufficient to destroy life by firmly fixing the muscles of the chest and not relaxing till asphyxia has caused death.

In spasmodic asthma, smoking tobacco commonly affords some relief. Its success is much greater in some instances than others, which, indeed, is the case with all remedies for asthma.

Whether the active principle of tobacco is destroyed in the system, or is eliminated with any secretion, is at present unknown.

Nicotine is supposed to be diuretic, but we are not told under what circumstances it acts.

CONIUM AND ITS PREPARATIONS.

The statements made by different observers of the physiological action of this medicine are in the main agreed; but they contain a few contradictions which cannot at present be explained.

Paul Guttman, who has lately published some excellent investigations (from which we have largely borrowed in this article) on the action of this alkaloid, says it is one of the most active and powerful of poisons, and is scarcely in this respect

second to prussic acid, and yet some vegetable-feeders, as the goat, sheep, and horse, are said to eat hemlock with impunity, perhaps because they are incapable of digesting it when eaten; but if it should prove conia is actually harmless to these and some other animals, even after its passage into the blood, and consequently that some animals are differently affected by it than others, the opposed statements of observers above alluded to, may, perhaps, by this fact be explained.

This medicine has no influence on the entire skin, even when used in large quantities; but strong preparations applied to wounds excite inflammation with its usual accompaniments of heat and pain.

The different preparations, or the pounded leaves, applied with poultices, ease the pain of ulcers, both simple and malignant, while, at the same time, the character of the sore is improved, as is shown by lessened discharge and diminution of its smell, and by the healthy look of the wound. The power of hemlock to ease pain rests on the evidence of highly competent observers, and cannot be gainsaid. Yet this remedy, in any of its forms, is now rarely employed for this purpose, although formerly it found constant use as a soothing application to broken cancers and malignant sores. When used to ease pain, a poultice may be made of the bruised leaves of fresh hemlock, or of linseed meal, smeared over with some of the expressed juice of the plant.

The alkaloid causes dilatation of the pupil, sometimes with subsequent contraction. This follows on the direct application of the medicine to the eye, as also when it is swallowed.

Conium, in smell, has been compared to the urine of cats and mice. It has a burning, acrid taste, on which account it produces an increased secretion of saliva. Conia, dissolved in alcohol, has been introduced into a hollow, painful tooth to remove toothache.

On the stomach and intestines hemlock has scarcely any influence. It may produce nausea, vomiting, and diarrhœa; but such occurrences are not common. Walshe has seen it useful in relieving the pain of cancer of the stomach.

That conia enters the blood is proved by the symptoms which occur when it is swallowed; but what physical or chemical changes it produces, if any, in the blood are at present unknown. When added to blood after its removal from the body, it produces in it no perceptible alterations.

The deficient coagulation and dark colour noticed by some observers after death by this remedy is often absent, according to the experience of others; and when present, is probably due to the asphyxia which has destroyed life.

The effects of conium on man and animals is very similar. The best account of the symptoms in man, from a poisonous quantity of the plant, is given by Dr. H. Bennett, who has recorded the case of a man who ate hemlock in mistake for salad. In this man there was first noticed weakness of his legs, so that his gait was faltering. As the weakness increased he staggered, as if drunk, and at the same time his arms began to be similarly affected. Perfect loss of all voluntary movement followed, and he was even unable to swallow. Lastly, the muscles of respiration were slowly paralyzed, and he died of asphyxia. Up to the time of his death his intelligence was apparently unaffected, but his sight was destroyed. There was also noticed slight movements in the muscles of the left leg.

The same, or nearly the same sequence of events happens in animals poisoned by hemlock. With rabbits, however, there occur early and severe convulsions. In frogs these are absent. In all the experiments and observations of Guttman there was produced gradual paralysis of the voluntary muscles, and then of those of respiration. The paralysis began first in the hind extremities, and next affected the anterior, and soon after the muscles of the trunk, and lastly, those of respiration.

How this paralysis is produced will be next considered. It is to Kölliker and Paul Guttman we are indebted for most of our exact knowledge on this subject.

The following are the parts which may be affected, namely, the muscles, the brain, the cord, and the nerves; and the action of conium on these parts will now be considered.

The paralysis is certainly not due to the action of the hemlock

on the muscles ; for muscles taken from an animal completely paralyzed by conia, and to such an extent that galvanic irritation through the nerves fails entirely to excite contractions, can be made to contract most energetically when the galvanic current is passed directly through the muscular substances itself. Nay, further, the irritability of muscles through which blood poisoned with conia has been permitted to flow is as great and as long-continued as that of muscles of the same animal protected from the action of the poisoned blood by a ligature of the blood-vessels.

Neither does hemlock paralyze by its effect on the spinal cord. For if a limb be protected from the influence of the poisoned blood by ligature of both its artery and vein, and the animal (frog) be poisoned and thoroughly paralyzed by conium, it can still perform powerful movements in the ligatured limb, while, also, irritation of any of the paralyzed parts is answered by energetic contractions in the ligatured limb.

This last experiment has greatly narrowed the question before us, namely, through what tissues does hemlock paralyze ?

In this experiment the only muscles which retained their power of movement were those protected from the poisoned blood by the ligature of the vessels, and it consequently follows that conia works its effects by its action on some of the tissues thus protected, that is either on the nerves or muscles. It also as conclusively follows that the paralysis is in no way due to the action of the poison on the brain or cord, for these parts were freely supplied with poisoned blood, while their nervous communication with the ligatured leg remain perfectly entire, and yet this limb remained quite uninfluenced. We have, therefore, to decide whether the conia affects the nerves or muscles, but this question has been already answered when it was proved the poison exerts no influence on the contractility of muscle.

The investigation may be carried a step further, and it can be shown that the poison affects the periphery of the motor nerves earlier than their trunks.

The following experiment of Guttman's proves this :—

A frog was chosen and one of its legs was, after the vessels leading to it had been tied, separated from the trunk, except by

the chief nerve, and the animal was then poisoned. The uninjured limb, in free vascular communication with the trunk, and in which the extremities of the nerves were exposed to the action of the poisoned blood, became quickly paralyzed, while contractions through the femoral nerve were easily produced in the limb protected from the poison by its partial separation from the body. In this experiment the main trunk of the nerve of both legs was equally subjected to the poison, but the termination of the nerve in one was exposed to the poison, but in the other was protected from its influence. The paralysis, as we have seen, occurred speedily in the limb whose peripheral nerves were subjected to the poison, showing the first action of conia to be on the terminations of the nerves. But after a time the trunks are themselves paralysed; for in the above experiment, after a time the partially severed limb became paralyzed below the point of section, even when the trunk of the nerve exposed to the poison was irritated, showing that after a time the trunk itself suffers from the conia.

Are the sensory or afferent nerves in any way affected? Apparently not, as they can certainly convey to the cord or brain afferent impulses in an animal rendered quite motionless by the poison.

The following experiment shows this:—If the legs of a frog be protected by a ligature of both their artery and vein, and the animal then completely paralysed by conia, energetic movements can be excited in the ligatured limbs by irritation of the paralyzed parts. Whether these movements are purely reflex, or whether they are voluntary, and are occasioned by pain, it is in this case impossible to decide, but at all events this experiment conclusively shows that in frogs the afferent nerves of completely paralyzed parts can convey impulses to either the cord or brain. As animals higher in the scale than frogs, such as rabbits, give, when the paralyzed parts are pinched, signs of pain, to judge from their look and from the noise they make, till the face and larynx are themselves affected, it is probable that sensory nerves convey impressions to the brain, even when the animal is almost perfectly paralyzed in respect of voluntary movement.

The vasor motor nerves of some parts appear also to be affected by conia, thus the arteries of the frog's foot fail to contract on irritation when the animal is poisoned by hemlock, but the conia leaves the motor nerves of some other involuntary muscles uninfluenced, as the peristalitic contraction of the intestines of rabbits killed by the alkaloid continued active after death.

When applied directly to the nerves hemlock destroys their conductivity. The poison produces no pain.

Its influence on the mind will next be considered. There is no doubt that both man and animals remain conscious of pain as long as they are capable of giving any signs of it, that is before the muscles of expression become paralysed.

Still this is possible, while at the same time the mind may in some way be affected. Schroff states that in a short time after the poison is taken there occurred a feeling of heaviness in the head, with giddiness, inability to think, great impairment of common sensibility; the sight was dimmed, and the pupil dilated taste lost its acuteness, and there was a feeling as of insects crawling on the skin.

From this account it appears the mind is in some degree weakened, and that many of the special senses suffer. In Dr. Bennett's case there was total blindness, but the hearing was but little, if at all, dulled. It is necessary to add, some observers assert that the mind remains quite uninfluenced by hemlock.

At an early part of this section it was stated that convulsions were among the appearances noted in poisoning by this substance. Such are present in some animals, absent in others. Frogs die without their occurrence, while rabbits appear to suffer from them. These spasms, Kölliker has suggested, may be due to asphyxia from paralysis of the muscles of respiration, which explanation, however, appears to be an insufficient one, as the convulsions often occur among the earliest symptoms, and before any asphyxia has resulted, nay, if a tube be introduced into the trachea, and artificial respiration be performed, they still occur. In man convulsions are certainly sometimes absent, as in the case recorded by Bennett none were seen; only slight movements in the left leg were witnessed.

Concerning the action of this poison on the heart, most conflicting statements have been made. Thus some authorities state it possesses the power to reduce the frequency of the pulse, and especially so when the heart beats too quickly from disease, as fever, &c., as then they state even a small dose suffices to produce a very decided effect on the pulse, while in health the same quantity remains without influence. Such are the conclusions of Wertheim.

In experiments with warm-blooded animals, poisoned by hemlock, it is true the heart ceases soon to beat, but this can be for a long time prevented if artificial respiration is performed, and the poison appears to leave the heart of the frog unaffected. Hemlock has been recommended in fevers and acute rheumatism, and its efficacy in these diseases has been supposed to be demonstrated by its action on the heart. But, as we have just seen, it is very doubtful if conia has any influence on the heart, or on these diseases in any way. It has been supposed to be useful in whooping and other kinds of coughs, and has lately been recommended by J. Harley, in chorea, when the succus conii in half drachm to drachm doses, or even more, must be given. In these large doses, conium certainly appears to control temporarily the movement, and to give steadiness to the patient, but if the medicine be not soon repeated, these effects wear off. It has yet to be shown that conium can shorten the course of this disease.

By Dr. Neligan, hemlock was largely used in various painful affections, and we have his high authority to prove its usefulness in such cases. He gave it in cancer, in rheumatism, and neuralgia. In no well authenticated case has it been yet shown that conium produces either sleep, coma, or delirium.

From what has been stated respecting the physiological action of conia, it is evident this remedy is not indicated in convulsive diseases dependent on affections of the cord, such as tetanus and strychnia poisoning, for the effects of this medicine and the diseases, just mentioned, are not antagonistic. Guttman, from whose valuable paper on the action of conia the chief part of our remarks has been extracted, put to the test of direct experiment the power of conia to arrest or check in any degree the tetanus

from strychnia. He strychnized frogs, and then gave them conia, but this last-named remedy had no power, even when administered in doses sufficient to completely paralyse the animal, to check in any degree the tetanic spasms produced by the strychnia.

From the account just given, it will be at once seen, how very similar is the action of conia to that of curare. There is one difference between these substances which has not been noted. Curare is not poisonous when swallowed, but is strongly so when injected under the skin. Conia is equally poisonous when employed in either way.

Dr. Neligan draws particular attention to the fact, that the only preparation which is of any value, is the succus, and so true is this, that the various statements made concerning the success and failure of this remedy in various diseases, must be accepted with caution, unless the conclusions have been deduced from observations made with this preparation.

MANCHESTER ROYAL INFIRMARY

CALABAR BEAN.

The following account is for the most part an abstract of Dr. Fraser's very valuable and elaborate investigations concerning the physiological action of the Calabar Bean:—

Birds are most easily destroyed by this poison, while frogs require as much as would kill a dog.

At present little is known of the influence of the Calabar bean or its alkaloid on the structures of the stomach. Dr. Fraser has ascertained that gastric juice does not destroy the power of this drug, and, further, when its solutions are injected into a vein they may be detected in the contents of the stomach, whence it has been concluded the active principle of this medicine is eliminated by this organ. It is, however, possible for it to find its way here by mere imbibition, as it would into all other excretions and secretions.

The active principles of Calabar bean quickly enter the blood,

and in animals, after small but fatal doses, Dr. Fraser states the following symptoms occur:—

First, and very speedily, there is seen a slight tremulousness, which, beginning in the hind quarters, spreads thence to the rest of the body. Soon the posterior limbs grow powerless, which want of power next seizes on the anterior extremities, and then on the trunk, till muscular movement ceases, and the whole animal is limp and flaccid. There is general paralysis. The bowels and bladder are involuntarily emptied, and the pupils generally contract.

At this time all reflex action of the cord is destroyed, for if the animal be anywhere irritated, no contractions respond to the call. Respiration, under the influence of the poison, grows gradually slower and slower, and at last ceases. Consciousness appears to be preserved throughout, for evidence of this is given as long as the animal retains the power of expression.

Immediately after death the pupils dilate.

At the examination after death the muscles appear to be unaffected, for they contract as they are cut, and respond to irritation of their nerves. The heart, moreover, continues to beat the usual time after death, and its parts cease to contract in a definite order.

After a large fatal dose, the symptoms and post-mortem appearances are much the same as just described, but of course death occurs sooner, and the symptoms follow each other in quicker succession.

Death may, after a very large dose, be almost instantaneous, and appears to be owing to syncope, for when the body is open the heart is found motionless, dilated, and flaccid, and only languidly contracts on stimulation. The vermicular movements of the intestines are also more sluggish than after a smaller dose.

Whether Calabar bean produces its effects by influencing the muscles, nerves, cord, or the brain, are questions which will now be severally answered.

Influence on Voluntary Muscles.—As muscular contrac-

tion could be easily and abundantly excited by direct irritation of the muscles, after the motor nerves had quite lost their power to conduct impressions, Dr. Fraser concludes this poison has no influence on the voluntary muscles. Moreover, the contractility continued a long time after death, and rigor mortis was long postponed in frogs, while it certainly was not hastened in warm-blooded animals—additional evidence of the absence of any paralysing influence on the muscles by Calabar bean.

The tremors in warm-blooded animals were generally slight, but were sometimes excessive, and might be called convulsions. This phenomenon was probably due to the direct action of the poison on the muscles (like curare), for if the sciatic nerve was divided before the animal was poisoned, still the limb thus cut off from nervous connection with the nervous centres, trembled; while, on the other hand, if the sciatic nerve was uninjured, but the arteries leading to the limb were tied or divided, then while the muscles of the body generally trembled, those of the ligatured limb remained quiet and at rest. This tremulousness often continues after death, and is excited by exposure and by the knife in cutting. It does not affect the whole muscle at the same time, but different parts in succession.

Influence on the Brain.—Dr. Fraser concludes the paralysis is not produced by any changes in the brain, for consciousness is intact when paralysis is marked and progressing, and in frogs, if the brain be removed and then the animal poisoned, the paralysis ensues as usual. Fraser thinks the bean exercises some influence on the faculties of the mind, and he comes to this conclusion from the effects of the drug on himself.

On the Spinal Nerves.—The paralysis is not produced by the action of the poison on these nerves, for long after general paralysis is produced, and even after death, they conduct motor impressions to the muscles.

But though muscular paralysis and death is not to be accounted for by the action of the poison on the motor nerves, but in another way as we shall shortly see, still the poison does after a time affect these nerves, and robs them of their power to

conduct impressions to the muscles. As with conium, so probably—Dr. Fraser concludes—with Calabar bean, the peripheral terminations of the nerves are first affected, and next their trunks.

The afferent nerves remain unaffected, and certainly their power of conduction is not lessened, indeed, Fraser thinks it is increased.

Influence on the Spinal Cord.—This structure is alone left as the part on which the paralysis can depend, and Fraser has shown the paralysis of the muscles is due to changes effected by the Calabar bean in this organ. Thus, he found in an animal poisoned by the bean he could excite no muscular contractions by galvanizing any part of the cord, while the motor nerves still retained their functions, and easily transmitted impressions to the muscles, which on their part abundantly responded to very slight stimulation of their nerves.

The reflex functions of the cord were also destroyed long before the nerves lost their power to conduct. For in animals poisoned by Calabar bean, and after reflex power was lost, pretty active muscular contractions could be excited by mild stimulation (galvanic) of the motor nerves, showing the arrest in reflex action is not owing to lowered activity of the motor nerves. Again, if the lower half of the cord is protected from the poisoned blood by ligature or section of its vessels, while the blood is permitted to flow to all other parts of the body, and the animal is then poisoned, reflex action is speedily lost in the anterior, while it is retained for hours in the posterior limbs. As the nerves of every part of the body are equally subjected to the poison, the loss of reflex power cannot be due to alterations in them, or otherwise the hind limbs should be equally paralysed with those in front. The only part protected from the poison was the posterior half of the cord, and it must be by the changes produced in this organ that Calabar bean destroys reflex power.

From its physiological action on the cord, Fraser recommends the ordeal bean as an antidote to strychnia, and he points out that it is superior to curare, as this last paralyses only the motor nerves, while the Calabar bean first paralyses the cord, and, after some time, the motor nerves also.

Action on the Heart.—With large doses, the movements of the heart at once cease, but after smaller ones, they grow quickly less frequent.

Fraser compares the Calabar bean with other cardiac poisons, such as antiaris toxicaria, tanghinia venenifera, digitalis, helloborus niger, h. viridis and the green resin of nereum oleander, all of which, after a time, diminish the frequency of the heart's contractions by prolonging the systole, and finally stop the heart in the systole.

Physostigma also diminishes the number of the heart's contractions, but lessens the duration of each systole, and at last the heart ceases to beat in the diastole.

How does it effect these changes in the functions of the heart? The paralysis of the heart in diastole, and the diminution in the frequency of its contractions by protracted periods of rest in a *dilated condition*, as well as the frequent renewal of its action after a long pause in diastole, might, in the first place, suggest that the inhibitory function of the vagi nerves was being exerted.

Fraser, however, gives conclusive experiments against this supposition. Thus he finds by section of both vagi, or by paralysing them with curare (which in a few minutes paralyses the motor and vagi nerves), the Calabar bean acted on the heart just as before. And again, when the brain and cord of frogs were destroyed, previous to their being poisoned, the same effects on the heart were witnessed.

Physostigma is no doubt a respiratory poison, and in many instances destroys life by the asphyxia it produces; but Fraser has shown it to be a cardiac poison as well, as the following experiment proves:—

He poisoned a retriever dog, and while the respirations were actually increased by one in the minute, the pulsations of the heart were diminished by one-half. This poison must, therefore, be considered to act on the heart directly, and not merely through its effects on the respiration. Fraser concludes, as it does not affect the heart through the vagi nerves, that it does so through the cardiac ganglia.

Added to blood, Fraser states solutions of Calabar bean made the red corpuscles of rabbits and dogs irregular, but effected no changes in those of birds or frogs, nor in the white corpuscles of any animals he examined.

The solutions appear to produce no change in the respiratory function of the blood.

The lymph hearts of frogs were paralysed in an early stage of the experiments.

The intestines of animals poisoned by this bean, at first moved with increased vigour, and at last contracted so as to much lessen the calibre of the gut. Afterwards dilatation occurred. The movements continued some time after death, unless the dose of poison was a large one, and then the movements were slight, and soon ceased.

Fraser noticed in rabbits poisoned by this bean, energetic peristalsis in the cornua and body of the uterus, and also in the ureters.

Calabar bean, as is well known, when swallowed, causes the pupil to contract, but the effect is still more marked if a solution of the bean be dropped into the eye.

How the poison accomplishes this effect, whether through the sympathetic or in other ways, are still open questions.

Dr. Robertson has paid great attention to this effect on the pupil, and he finds, even before the pupil begins to contract, the power of accommodation in the eye is lost, and objects can only be seen at a limited distance, of about a foot, beyond which everything appears hazy and indistinct. Objects at all distances look nearer and larger than they really are. There was also felt at the time much straining and heaviness in the affected eye—a feeling similar to that after a close inspection of fine objects.

In about twenty minutes after the application of the solution, the pupil was contracted to one-half, and the field of vision of the eye still further shortened. The contraction may increase for an hour or more, and during this time the sight of the other eye remains natural. The contraction ultimately slowly yields, but more than 24 hours may pass before the pupil is naturally dilated again.

The contraction may be extreme, then but little light finds its way through the narrowed pupil, in consequence of which the opposite pupil sympathetically dilates.

The accommodating power, as has been mentioned, is first affected before the pupil, and is also the first to recover itself.

Dr. Robertson further showed belladonna and Calabar bean to be, in their action on the eye, directly antagonistic.

Dr. Fraser has obtained some curious results from the topical application of solutions of Calabar bean to different structures of the body, as on the nerves, &c. He applied some of the solution of Calabar bean to the trunk of the sciatic nerve, choosing this on account of its comparative freedom from blood-vessels, and, to his astonishment, he found sensory conductivity was lost sooner than motor, and was at last completely destroyed.

This loss of power to conduct sensory impression was not produced by mere imbibition of the fluid altering the physical state of the nerves, as other nerves kept moistened by water for a similar time, experienced no similar alteration in their functions. The completeness of this loss of power to conduct afferent impression, was well shown by poisoning the animal by strychnia, after which no convulsive movement could be excited by irritating the structures below the poisoned sciatic nerve.

The irritability of the gastrocnemius was also destroyed by the local employment of strong solutions of the bean. This, too, Fraser proved was not owing to mere imbibition.

When the solution was painted on parts of the intestines, these became relaxed, and the vermicular movements, when they reached these points, skipped over them, and continued in the portions beyond.

The therapeutical application of this remedy will next be spoken of. It is abundantly used to produce contraction of the pupil.

Some time ago it was suggested as probable that this bean would prove of much service in tetanus and chorea.

Dr. Fraser has lately written a short but interesting paper on this subject, and from this we again largely borrow.

This authority believes the bean may be used with the

greatest benefit against tetanus, for he found the effects of strychnia on frogs can be arrested by the Calabar bean.

He has further collected twelve cases of tetanus treated by this remedy. Of these, eleven only are useful in estimating the value of this drug, as the twelfth case was not treated with Calabar bean till very near its close; indeed, only one dose was given before the patient died. Of the remaining eleven cases, nine recovered, and of the two fatal cases, one, Dr. Fraser thinks, should be excluded, as telling against the efficacy of Calabar bean, as this remedy appears to have been given in insufficient quantities.

Dr. Fraser very naturally insists on the importance of employing the drug at the very beginning of the attack, and enforces the value of this advice by the remark, that it has now been shown when muscles contract they beget a substance which excites muscular contraction; and, further, at the beginning of tetanus only a limited part of the cord, or ganglia of the brain, are involved, but speedily, on the continuance of the disease, the whole of these structures are affected. He then says, to give his own words :—

"The British Pharmacopœia contains two preparations of physostigma, the powder and the extract. I think the powder should not be used, as there is considerable evidence to show that the functions of the stomach are impaired in this disease. By giving it we not only increase this evil, but we fail, on account of the comparatively slow action of the powder, in securing the important object of affecting the system as rapidly as possible. The extract should be always used, as it is the most concentrated preparation, and one on whose constancy we may rely. It may be given in the form of pill, or of solution and suspension in water (mixture), or of solution in weak spirit of sp. gr. 0·920 (thirty-two grains to the fluid ounce). I prefer the first and last of these forms, as that with water decomposes in a few days.

"Physostigma may be administered by the mouth, anus, or subcutaneously; and the special peculiarities of each case will be the best guide in determining which of these should be used. I

should myself feel inclined always to commence the treatment by subcutaneous injection, to repeat such injection until the system is decidedly affected, and then to administer the remedy by the mouth, in a dose three times as large as is found necessary by subcutaneous injection. Such a plan might be quite safely followed in a child of even nine years. If the remedial effects continue to be produced by administration by the mouth, it should be persevered with, for such administration has obvious advantages as far as the convenience of the practitioner is concerned. In the more severe cases, however, I believe subcutaneous injection should be alone employed. The distress and increase of spasm caused by swallowing, or the impossibility of introducing substances by the mouth, will render this necessary. I cannot, also, urge too strongly that subcutaneous injection should always be used when severe and continuous spasms occur, when a fatal result is imminent from the exhaustion caused by prolonged and frequent convulsions, and when apnœa threatens at once to close the tragic scene. By it we obtain the quickest and most powerful effects. Administration by the anus will be rarely necessary. It may, however, be employed to relieve the stomach, and will then be occasionally useful.

"From the preceding remarks, it cannot be expected that any arbitrary rules of dosage can be laid down. For an adult, one grain of the extract by stomach, or one-third of a grain by subcutaneous injection will be generally sufficient to commence with. This should be repeated in two hours, when its effects will usually have passed off, and the succeeding doses may be modified according to the experience that will thus be gained. When used by subcutaneous injection, the dose of extract should be carefully mixed with ten or fifteen minims of water. This mixture has always an acid reaction, which is sometimes so decided as to produce slight irritation of the cellular tissue; but this can be avoided by carefully neutralizing the mixture with a solution of carbonate of soda. Suppositories, made with oil of Theobroma and white wax may be employed when administration by the anus is desired. Each of these should contain two grains of extract. For children, we must be guided by the general rule of

employing, according to age, one-third or one-fourth, or even less, of the above doses. It will be found necessary to repeat these doses frequently—every hour, every hour-and-a-half, or every two or three hours—and, of course, the severity of the disease and the effect of the remedy will be the best indications for this. The great object is to produce as quickly as possible, and then to maintain, the physiological effect of physostigma in diminishing reflex excitability. The doses must, therefore, be continued in increasing quantities until this physiological effect is produced, or until the sedative action of the drug on the circulation is carried to a dangerous extreme, or until constant nausea and vomiting compel us to desist.

"This nausea is, I believe, due to the action of physostigma in causing energetic contractions of the stomach and intestines. To this cause may also be referred a peculiar epigastric sensation, which is one of the first symptoms of the action of this drug, whether it be administered by the stomach or subcutaneously, and which is always relieved by eructation. The catharsis that physostigma causes—probably an advantageous effect in tetanus—is another result of this intestinal contraction, though it is also due to an increase of secretion by the intestinal glands.

"Another physiological effect of physostigma is excessive perspiration. This is most strikingly observed when a large dose is administered by subcutaneous injection. It may be of some importance in the treatment of tetanus, for sudorifics are vaunted as reliable remedies for this disease; but as I am at a loss to understand why perspiration should in itself prove beneficial, I mention it only as an indication that physostigma is affecting the system.

"It might reasonably be expected that the active principle of physostigma—eseria—should be valuable in tetanus, and especially for administration by subcutaneous injection. It is, however, an alkaloid that is very difficult to prepare, and as far as my knowledge of its properties is concerned, it appears to be somewhat unstable. There is, besides, but little advantage in employing a more active remedy than the extract of physostigma.

"In these observations, no distinction has been drawn between the traumatic and idiopathic varieties of tetanus. As far as treatment is concerned, they only differ in this, that the traumatic variety is usually the more severe and acute, and that it, therefore, generally demands a very energetic and active employment of the remedy."

He next makes a few remarks on the power of this remedy over chorea, but at present there appears to be little evidence on this subject. He says—"The treatment of this disease will rarely require to be so active or energetic as that recommended for tetanus. Physostigma should be administered either in the form of powder or of tincture. From three to six grains of powder, thrice or four times daily, may be given to children, and from ten to twenty grains, as frequently, to adults."

THERAPEUTICS OF THE PREPARATIONS OF BELLADONNA.

As external applications, the preparations of belladonna are of frequent and great use, for there are no applications so reliable for the relief of pleurodynia as the liniment or plaster of belladonna, and the great sensitiveness of the skin and irritability of the muscles of the chest in phthisis may be lessened or removed by the same remedies. The liniment is to be preferred to the plaster, both as the stronger and cleanlier preparation, and should be rubbed over the tender and painful part several times a day, according to the severity of the pain.

But while it is generally true that the liniment is to be preferred to the plaster, cases of pleurodynia occur that are better treated by the latter than the former, as the plaster appears from its constant application in such cases to have a greater power over the pain than the liniment. The liniment of belladonna, or the ointment of its alkaloid, is sometimes used in neuralgia of the face.

In the treatment of lumbagos or myalgias, the belladonna

plaster is often of great service. These complaints may attack different parts of the back, and be sometimes situated across the loins, or between the shoulders, or may, in some instances, be only felt in the tendon or part of a muscle, or in an articulation, such as that between the sacrum and ilium. When thus limited in extent the disease is generally very obstinate and difficult of cure, but may often be lessened or even removed by belladonna preparations.

Again, it commonly happens for a more general attack of lumbago, affecting, perhaps, the whole loins, to leave behind after treatment one painful spot, which may only distress the patient when the body is moved in one direction. Such remnants of a lumbago very generally resist the usual methods of treatment, and are, perhaps, driven from one spot only to re-appear in another. They may, in general, be greatly lessened, if not altogether removed, by the plaster of belladonna. It is better, when used for this purpose, to make the plaster of some size.

Belladonna, even when locally applied, appears to possess the power to check secretion. The evidence of this will appear as we proceed. This property is very clearly shown in the complete arrest of the secretion of milk, when the preparations of belladonna are applied to the secreting breast. In accomplishing this effect these applications are often of the most signal use. It constantly happens for medical men to be consulted by women who for some cause are unable to suckle their children. The milk, in consequence, accumulates, and the breasts become tumid, swollen, and exquisitely tender and painful. In a little time, if the milk is not removed or its secretion checked, inflammation sets in, which ends in a painful, exhausting abscess.

In belladonna we have a sure remedy for this state of things, as it can completely arrest the secretion of the milk, and save the patient from the troublesome and tormenting consequences above described.

Where it is impossible to suckle, and where the milk is abundantly secreted, belladonna should be at once employed. But even when the secretion has extensively accumulated, nay, even when inflammation has commenced, and the breasts are

tense, hard, knotty, red, hot, and exquisitely painful, in a few hours, by the use of belladonna, all these conditions with the pain may be much diminished, and often in 24 hours the breast can be made naturally soft and comfortable again.

But the good effects of belladonna are sometimes still more signally displayed, as even when the breasts are much inflamed and very hard, and when suppuration is greatly feared, by the diligent application of the preparations of belladonna the inflammation may be subdued and an abscess averted.

Inflammations of other parts, threatening to end in abscesses, have, in the hands of Mr. Christopher Heath, been equally well treated by the preparations we are speaking of. Mr. Heath has thus been able to prevent abscesses in the neck and elsewhere. The same authority finds, and the writer's experience fully corroborates his testimony, that when suppuration has begun, it, and the surrounding inflammation, may be much controlled and the pain much subdued by the same treatment. Boils and carbuncles are thus well treated by the local application of belladonna.

To stop the secretion of milk the liniment, the extract, the ointment, or a drachm of the tincture to an ounce of olive oil, may be used. The liniment is the most speedily effectual. It should be especially rubbed over the areola around the nipple.

The action of these applications may be admirably assisted by frequent fomentations with very hot water, unless cooler water should be found more agreeable and soothing. If this practice be adopted, the nurse must be cautioned to wipe the skin perfectly dry, or the friction with the liniment will irritate the skin and produce a sore.

The influence of belladonna preparations on secretions is still further shown by their power to check the perspiration. The following are the grounds for this assertion:—A man, 45 years old, had for many months been troubled with very profuse sweating of the right side of the face and neck. On the slightest exertion, or if near a fire, or when excited, the sweat ran down the face and neck in streams, soaking his collar and the band of his shirt. The perspiration produced an abundant crop of

vesicles of miliaria, which were strictly limited to one-half of his face. His face at such times was not red nor injected. This abundant sweating was considerably reduced, and made but little more than natural by the employment of the liniment of belladonna two or three times a day.

The effect of belladonna in this instance led the writer to test its powers over other kinds of sweating, and with the following results.

The sweating which is often very profuse about the head and face of young children, and which may be sufficient when they sleep to soak their hair and the pillow on which they lie, can be completely checked by the liniment of belladonna, used twice or three times a day. After a few days of its employment the application may be discontinued without a return of the perspiration. Again, many grown up people, even when in health, and for all their lives, are troubled with profuse sweating of the hands or feet. This may be so great as to run off them in drops. It is especially noticeable at the tips of the fingers and the ball of the thumb. These annoying complaints may always be much lessened, and sometimes completely removed by the belladonna liniment rubbed into the hands or feet three or four times a day. Whether such persons can be cured of these complaints, so that the liniment may be discontinued, the writer cannot at present say.

It is probable the secretion of that abundant and foul-smelling sweat from the feet, with which some people are afflicted, may be prevented by the belladonna applications. In making the liniment, Eau de Cologne may be used instead of simple spirit. This forms an agreeable smelling liniment. That in the cases just described the effects are due to the belladonna and not to the spirit, has been experimentally proved.

When used to check sweating about the head and face, too much of the liniment should not be applied at a time, or it becomes absorbed, dilates the pupil, and obscures the sight.

Remembering that in acne there is a too abundant secretion from the sebaceous follicles, the writer was induced to use the same application, with the hope of checking the secretion and so

controlling the disease. This treatment has appeared to be of some slight service, although its effects are much less apparent than on the sweating above described.

As local applications belladonna preparations are of still further use. Thus, the extract is employed to relieve the pain of fissures of the anus; it should be smeared over the painful cracks in the mucous membrane.

By Trousseau the extract, in conjunction with tannin, in the proportion of one or two grains of the former to six or eight of the latter, is recommended in leucorrhœa with ulceration of the os uteri, and also in neuralgia of the uterus. In the former complaint the belladonna arrests the too abundant secretion from the mucous glands, on which the leucorrhœa depends, while its action in this respect is assisted by the tannin. In both diseases the belladonna is very efficient in relieving pain. The mixture of belladonna and tannin may be wrapped in cotton wool, or made into a bolus with cocoa nut fat, and then one or other of these applications is to be placed in contact with the painful and over secreting os. To such treatment many of the most obstinate forms of leucorrhœa completely yield.

In similar cases, that is where the disease depends on too free a secretion of the mucous glands about the os uteri, and where this condition is accompanied by much pain, if the following injection be used good results will be obtained: Bicarbonate of Soda a drachm, Tr. of Belladonna two ounces, water a pint. Of this one or two syringefuls are to be injected into the vagina, and made to reach the mouth of the uterus. To effect this the syringe should be introduced as far as possible while the patient lies on her back with her buttocks raised by a pillow placed under them. The injection should be used cold, and some of it be allowed to remain in the vagina for some few minutes.

Recently it has been recommended by Dr. Anstie to use atropia in hypodermic injection, to relieve local pain and spasm. He vouches for its great excellence—"It should be employed in the form of solution of the sulphate, four minims containing $\frac{1}{60}$ grain, two minims will be the proper commencing dose in adults,

unless the pain to be relieved be very severe. It should be cautiously increased to $\frac{1}{60}$ or $\frac{1}{50}$ grain, more can seldom be needed." He further states, "it is somewhat less frequently tolerated than morphia, but persons quite unable to bear morphia will often bear atropine, and *vice versâ*." Dr. Anstie has further employed atropine as an injection with great benefit in one case of asthma, and in two of glaucoma.

Dropped into the eye, or applied to the skin in its neighbourhood, or taken by the stomach, preparations of belladonna very speedily produce extreme dilatation of the pupil. Solutions of atropia are often locally used to effect this dilatation in iritis, and other diseases of the eye, or when for any other purpose such dilatation is desired.

Belladonna is useful both as a local and internal remedy in conjunctivitis and other inflammations of the eye.

Neuralgia, especially of the fifth nerve, as of the brow or under the eye, also severe pains in the eye-ball, with intolerance of light, and even sciatica, are sometimes much diminished, or even removed by the local application of the liniment or ointment of belladonna. In obstinate forms of the above diseases the belladonna may act better after the skin has been removed by a blister, or a sore has been made by an issue.

By the use of belladonna in any of its forms, there is produced, if the dose be a full one, great dryness of the tongue and roof of the mouth, extending down the pharynx and larynx, and consequently some difficulty in swallowing, with hoarseness, and even dry cough. Dryness of the Schneiderian membrane, and of the conjunctiva, with much injection of the latter, may also be present.

After about two hours, Dr. J. Harley says, the dryness of the mouth gives way, and is replaced by a viscid, sticky, acid, and foul-smelling secretion, and the mucous membrane becomes clammy, and the tongue is covered with a white fur. In many of these symptoms we have further evidence of the power of belladonna to check secretion.

This remedy may be usefully employed in some diseases of the throat. Thus the writer thinks those who have watched the

action of this plant on acute inflammations of the throat and tonsils, will be convinced of its power to subdue these.

It may thus be usefully employed in conjunction with aconite, which latter drug has a still greater power over these inflammations (when the pulse is full and the skin hot and dry). Some writers have praised belladonna on account of its power over putrid sore throat and the chronic inflammation left after the acute stage has subsided. J. Harley has seen it clean and moisten the tongue of a typhus fever patient.

The influence of belladonna on the digestion is not known.

The tincture may afford relief in some painful affections of the stomach—a very vague statement, but as exact a one as our present knowledge will permit. The author has heard it praised in "gout of the stomach."

Neither is it known in what way this medicine affects the mucous membrane of the intestines, but remembering its influence on the lining membrane of the mouth, it may be conjectured it lessens the secretion of the intestinal canal.

By Trousseau belladonna has been recommended in obstinate constipation, and there is no doubt that in many instances it admirably succeeds. He advised doses of $\frac{1}{6}$th to $\frac{1}{4}$th grain of the extract, to be taken once a day, either night or morning. This quantity is to be gradually increased, and when the constipation is removed the medicine should be diminished or discontinued. Colic of the intestines may often be relieved by this medicine; it is especially serviceable with children who are troubled with this complaint. No doubt the cause of the colic should be sought for and removed, but it may happen this cannot be detected when belladonna may do good.

The active principle of this medicine is readily absorbed into the blood, for the symptoms which arise after its administration abundantly prove this.

By belladonna the pulse is at first increased in quickness, fulness, and force. The increase may be as great as 50 to 60 beats in the minute. This condition of the circulation continues till the tongue and mouth become moist and clammy, when the pulse diminishes in frequency and loses in strength (J. Harley). In

fatal cases the pulse grows rapid, intermittent, and weak. By J. Harley belladonna is considered to be a powerful heart tonic. Dr. Nunneley, in his observations, finds belladonna does not increase the pulsations of the heart of frogs, neither does it in these animals dilate the pupil, and hence with the frog the action of belladonna appears to be different from what it is on man.

After a considerable dose of belladonna the face becomes much flushed, the eye bright, dry, and injected, the pupil dilated, the sight dim and hazy, while the power of accommodation in the eye for distance is lost.

The mind and senses are peculiarly affected. There is much mental excitement; the ideas, at first rapid but connected, become extravagant and wild; there is often decided delirium, with illusions of a pleasing character.

Sometimes there is a constant restlessness, and the person keeps continually moving, and cannot be quieted. A kind of somnambulism is occasionally observed; thus cases are recorded where, under the influence of belladonna, the patient has for hours performed the movements customary to their occupation. It is narrated of a tailor that he sat for hours moving his hands and arms as if sewing, and his lips as if talking, but without uttering a word.

The delirium may be furious and dangerous, requiring the patient to be restrained; nay, it is recorded of one person poisoned by this drug, that so great was his madness he was ordered to be confined in a mad-house.

Sometimes this mental disturbance may result from a very small quantity of the plant; and so great, indeed, is the susceptibility of some persons, that they have been extremely affected by the drug when this has been applied to the skin in the form of plaster or ointment.

By belladonna the muscular power is weakened and the gait is unsteady and staggering. The person may lose control over his movements, and be unable to direct his course, and, in consequence, run against objects he sees and desires to avoid. After the medicine, there is experienced by most observers severe pain

in the head, generally situated over the forehead and in the eyes. With some, these pains are felt in the top of the head.

There is also present singing in the ears, with more or less giddiness. Spasmodic contraction of the sphincter of the bladder has been observed not unfrequently with persons poisoned by this plant; and a scarlet rash has broken out on their skin; this is said to be like that of scarlet fever, and to be most intense in the neighbourhood of the joints.

Belladonna is not unfrequently used to relieve pain. By Dr. Anstie it is considered the best remedy to relieve every kind of pain in the pelvic viscera. Some neuralgias also, no doubt, yield to this medicine; it appears to possess most power when the disease is situated in the fifth nerve, but cases are recorded of relief afforded by it when the disease has affected other nerves, as the sciatic.

By Trousseau the following method was advised:—To administer $\frac{1}{5}$th of a grain every hour till giddiness is produced, and then to lessen the quantity; but the medicine is to be continued for several days.

The same authority employed belladonna with success in epilepsy. His method was the following:—

"During the first month of treatment, the patient takes a pill, composed of extract of belladonna, and powdered leaves of belladonna, of each $\frac{1}{5}$ gr. every day, if his attacks occur chiefly in the daytime; or in the evening, if they are chiefly nocturnal. One pill is added to the dose every month, and whatever be the dose, it is always taken at the same period of the day. By this means the patient may reach the dose of from 5 to 20 pills and even more." The dose is to be regulated by the circumstances of the patient. By such treatment, it is said, if a cure cannot be effected, much relief is obtained.

Belladonna often succeeds in asthma, and allays both the cough and oppressed breathing of this complaint. It must, however, be employed in considerable doses to ensure success. Dr. H. Salter has lately pointed this out, and the author has often verified his assertion. It may be necessary to give as much as ten minims of the tincture every two or three hours, which

quantity can generally be well borne, but if there be produced any of the undesired symptoms of belladonna, the dose must be reduced. Such quantities need only be taken at the time of the paroxysm, but when this lasts for several days, the medicine in the quantity recommended should be given till an impression on the disease is obtained. The effect of such doses on the disease is often most satisfactory, for the attack may be made much milder, or altogether prevented, when other remedies were without avail.

Belladonna is one of the best remedies for whooping-cough, but in this disease, as in asthma, to obtain any good from it, it must be employed in very considerable quantities. Thus to children two and three years old, the author often gives as much as ten minims of the tincture every hour, and this quantity usually produces no effect, except on the disease, for neither is the pupil dilated, nor, as far as one can judge in children so young, is the throat made dry; and it certainly is not in children a little older, and who can explain their feelings.

If there be drowsiness or delirium, or dilatation of the pupil, of course the dose must be diminished. The only symptom of the drug the author has witnessed in these large doses, is dilatation of the pupil. It is well known that children bear belladonna much better than adults, and this fact will account for the slight effect of so large a dose, and also for the small influence which less quantities have on whooping-cough—a disease of childhood. With these doses, the severity and frequency of the cough is often much reduced, even during the period when this is most violent and convulsive. But like all other remedies for this disease, belladonna will be of little use, if the child is exposed to cold and cutting winds, and, if the weather is cold, it is necessary to keep the child confined to the house in a warm room. Of course, if the weather is mild, out-door exercise is highly beneficial; but cold must be most carefully avoided. Even with these precautions, the author believes belladonna is decidedly inferior to lobelia inflata. It is believed by many that belladonna and other remedies for whooping-cough succeed in some epidemics, but fail in others, but it is probable the above explanations ac-

count for the apparent capriciousness of this medicine. Another circumstance which will explain the apparent uncertainty of belladonna, is its little effect on this disease when there is present any irritation of the body, as from teething or worms, and it is also less powerful over the disease when there is much catarrh or bronchitis of the lungs. Belladonna has been considered to be of especial use at the third week of the attack—that is, at a time when, if the child is kept warm, the violence of the convulsive attacks is declining, and when the febrile stage has passed away.

Belladonna is often useful in other coughs, although it is impossible with the present knowledge on this subject to lay down precise rules for its employment.

It is often useful in certain forms of headache. The following are the indications for its use, namely, where the pain is situated over the brows and in the eyeballs, and these latter feel as if too large for the head, and as if they would be forced out of the skull. The headaches to which we are now referring, and over which belladonna prevails, are not due to stomach or uterine derangements; indeed, very often their cause cannot be discovered; but when it can, this must be removed. Not unfrequently such a pain is due to weakness and overwork, and is especially met with in young women. Three minims of the tincture should be given every three hours.

The delirium of fevers as of typhus fever can, it is said, be controlled by belladonna.

Of all the remedies we possess, there are none superior to belladonna in removing that troublesome affection—incontinence of urine of children. It is both speedier and more certain than any other remedy. It must to be successful, be given in full doses of 10 to 20 drops of the tincture three times a day. Small quantities often fail, where large ones immediately succeed. This complaint is sometimes not limited to the night, but may trouble children even in the day. These severe forms will often cease on the use of belladonna.

But while belladonna is thus effectual in this complaint, still it is not uncommon to meet with cases which completely resist

its use, although there are no worms in the intestines, nor any irritation about the rectum or other reason to explain its failure. Should belladonna fail, then recourse can be had to strychnia, cantharides, turpentine, santonine, or galvanism.

Belladonna, used internally or applied externally, certainly appears able to diminish erysipelatous inflammation. It may be given for this purpose in combination with aconite, which has a far more powerful influence over this inflammation than belladonna, when the skin is hot and pungent and the pulse firm and resistent.

Belladonna has been recommended as a preventive of scarlet fever. So much prejudice has been introduced into this question, that it is difficult to learn how far it is useful for this purpose.

The author, however, thinks that the proof advanced in favour of the power of this drug in this respect, is greater than that arrayed against it, and that at least sufficient has been shown to make it desirable to administer it, and give those exposed to contagion the benefit of the doubt.

By Brown-Sequard, it is maintained that both belladonna and ergot of rye have a powerful influence on the unstriped muscular fibres of the body. He instances the power of both to dilate the pupil and to produce contraction in the uterus. He has seen the vessels of the pia mater of dogs contract after large doses of belladonna or ergot of rye, and he further states that both have the property of lessening congestion of the cord, for, after full doses of either medicine, the reflex irritability of this part diminishes. But he further states, one acts especially on the involuntary muscles of one part, and the other chiefly on those of another part.

Thus belladonna affects especially the pupil, blood-vessels of breast (and so arrests the secretion of milk), muscular fibres of bowels, sphincter of bladder (and so removes nocturnal incontinence of urine [?]), while ergot acts especially on the muscular structure of the womb and blood-vessels of the cord.

From the foregoing facts and speculations, he recommends the use of these two remedies in those forms of paralysis depen-

dent on chronic inflammation. Ergot is given by him internally, while belladonna is applied along the spine in the form of plaster or ointment.

Belladonna, it has been maintained, paralyses the sympathetic in the neck, and also diminishes the power of the nerves to conduct impressions to or from the brain.

Dr. Nunneley has found that belladonna causes no contraction of the arteries of the web of the frog's foot when the medicine is introduced into the circulation, nor when it is locally applied.

Its action on the pupil has been variously explained.

By one school it is taught to depend on paralysis of the third nerve supplying the iris. Another teaches it is due to excitation of the sympathetic; and a third maintains that the remedy prevents turgescence of the vessels of the iris, and so produces the dilatation.

Belladonna has been found by some of service in the treatment of seminal emission.

Children, as is well known, bear belladonna better than adults, another particular in which its antagonism to opium is displayed.

Of this antagonism we may next speak. It has been assumed that as belladonna and opium are opposed in their action in some respect, as on the eye, &c., they must be opposed in every particular, and the one may be used as the antidote of the other. There is much evidence, although it is not perhaps conclusive, to show that the one can prevent life being destroyed by the other, for if a large dose of opium be given, the serious symptoms it produces are said to be removed by belladonna, and *vice versâ*. But although this antagonism may hold good in many respects, there is no proof whatever of it being universal. Dr. Erlenmeyer concludes, that in respect to their action on the brain, they are antagonistic, and that no coma will result when they are administered conjointly, but that they do not counteract each other and prevent loss of sensation, and hence he recommends, and often uses them in combination to relieve pain.

That atropine is separated from the body in part by the urine may be proved by the introduction into the eye of some of the

urine, voided by those to whom the belladonna has been given, when the pupil of the eye thus treated will be dilated. J. Harley states, that after two hours the whole is separated from the body, as none can be found in the urine after that time.

Dr. Garrod has shown, that caustic fixed alkalies destroy the active principle of belladonna, hyosciamus, and stramonium.

The carbonate and bicarbonates of potash and soda do not possess this power.

Lime-water has this power, and has been recommended as an antidote in poisoning by belladonna.

STRAMONIUM.

This remedy produces symptoms very similar to those of belladonna. It is mainly used in asthma, to set free the chest from spasm, and is then very generally smoked, with or without tobacco. It is especially useful in pure asthma, that is, when the lungs are structurally free from disease, and is useless when the dyspnœa is owing to heart disease. When smoked, 20 grains of the dried leaves or ten of the powdered dried root should be employed. The smoke should be inhaled into the lungs, and thus it is preferable to smoke the plant without tobacco, as few persons can draw the fumes of the latter into the lungs without great discomfort. There is no doubt, stramonium used in this way is very successful in many cases of asthma, but in others without apparent reason, it fails, and in those which it beneficially affects, its influence, by use, gradually grows less. It has been used in neuralgia.

Like belladonna and hyosciamus, its active principle, as Dr. Garrod has shown, is destroyed by caustic potash and caustic soda.

HYOSCIAMUS.

In many respects this drug corresponds, in its behaviour on the body, to belladonna and stramonium. Thus it produces dryness of the mouth and throat, dilatation of the pupil, with presbyopia, lightness, and swimming in the head with delirium and halucinations. The person appears as if drunk, and often displays a strong desire to fight. There is sometimes aphonia, and often sleepiness, with oppressive, disagreeable dreams; a red rash has been observed when large doses have been taken. By it the pulse is first much lessened in frequency, but soon recovers itself, or becomes even quicker than it was before the medicine was taken.

Hyosciamus is most generally used to produce sleep when opium disagrees, but many people doubt if it can accomplish this in any other way than by removing pain. It has also been employed in neuralgia.

Like atropia, its active principle is destroyed by the fixed caustic alkalies, as has been proved by Dr. Garrod.

HYDROCYANIC ACID.
CYANIDE OF POTASSIUM.

This acid is one of the most poisonous substances known, and is alike destructive of animal and vegetable life.

Its acid reaction is too weak to enable this property to contribute to its effects on the body.

Solutions of these substances when long applied to the skin, excite some inflammation, which is much greater in the case of the cyanide than of the acid, as the former has a strong alkaline reaction.

If continued in contact with the skin for some time, they

remove in some degree its sensibility, and they have been used for this property in some painful diseases, as "neuralgia and rheumatism," but are now quite superseded by other and more successful remedies. They are, however, much more successful in allaying the tormenting itching of urticaria.

For this purpose a drachm of the cyanide of potassium should be added to a pint of water, and the itching skin be bathed with this lotion. In it the action of the prussic acid is assisted by the potash, with which it is combined. It need hardly be said such a lotion must not be applied to the broken skin, for fear enough should be absorbed to destroy life. This lotion is, no doubt, very successful in removing the itching of urticaria, but is inferior, in the author's experience, to a wash containing ten to twenty grains of benzoic acid to the half-pint of water. Hydrocyanic acid and the cyanides have been employed for the itching of other complaints, as of lichen, eczema, &c.

In the mouth, the acid is possessed of a bitter characteristic taste, and excites a feeling of itching. It stimulates the flow of saliva, possibly by its action on the mucous membrane of the mouth.

In the stomach, in health, the acid, in moderate doses, appears neither to produce or suffer changes; it is nevertheless much used, and with frequent benefit, in painful diseases of this organ, as in chronic ulcer, cancer, chronic gastritis, gastralgia, &c. Not only does it occasionally mitigate the pain of these affections, but it may also check vomiting, if this be present.

Hydrocyanic acid passes very speedily into the blood, and is as speedily eliminated, probably with the breath, and hence, when a poisonous quantity is taken, if life can be supported for half an hour, the patient is generally safe.

How it destroys life is still a disputed question; as has been seen, it is as equally fatal to plants as animals, and hence it is not necessary that it should act on the nervous centres, which some have supposed from the rapidity of its action. Kölliker from his experiments on frogs, concludes that with these animals, it first paralyses the brain, next the cord, and then the motor and sensory nerves.

Hydrocyanic acid is frequently used in whooping-cough, and is often useful after all fever has declined, and when no complications are present. It is especially useful towards the end of the disease, at which time it will often reduce both the frequency and violence of the cough.

It is also useful in other coughs, as of consumption.

OPIUM, ITS PREPARATIONS AND ITS ALKALOIDS.

These preparations produce no change in the entire skin. They are frequently added to poultices to assist these to remove pain, even when the skin is unbroken; but it is generally considered that opium so used remains unabsorbed, and thus without effect. But a case narrated to the author by his friend, Dr. Phillips, is in contradiction to this opinion, as in this patient there was noticed much drowsiness and sleepiness for some days, which could not be accounted for until it was found the nurse added, of her own accord, a pretty considerable quantity of laudanum to the poultices which were being applied. On discontinuing the application of the opium, the sleepiness at once disappeared.

This effect of the opium was observed by several medical men.

By the abraded skin the active constituents of opium are readily absorbed, and can act as local sedatives, easing the pain of irritable sores, as of cancer and the like. For this purpose, morphia may be dissolved in glycerine, and when spread on lint, be applied to the painful cancerous or simple sore.

The hypodermic injection of morphia is very useful in relieving pain. For this purpose it may be used in the various neuralgias, in sciaticas, lumbagos, renal and biliary calculi, and in most painful chronic diseases. It not unfrequently happens for the first injection at once to remove permanently the pain, although these painful diseases may have lasted a considerable time, and have resisted other treatment. So favourable a result is not, however, very usual, though when less successful, these

injections always relieve or remove the pain for a time, and this relief may last many hours, or even days. Other forms of pain are also amenable to these injections, such as of pleurisy, peritonitis, &c. But unless the pain be very severe, or has resisted other treatment, these injections should not be resorted to, as they very generally produce much giddiness and drowsiness, and even intoxication, and the patient may be completely unfitted for any work for the rest of the day. Such injections must be looked upon as a last resource, unless the pain, as we have said, is very severe, and it is important at once to afford relief. In sciatica, neuralgia, and other diseases, which last for a long time, these injections may be used to afford temporary relief, but they must be had recourse to as seldom as possible, or the patient becomes as much habituated to opium as an opium-eater, and suffers the same distressing feelings on the discontinuance of the injections as an opium-eater does on the withholding of opium. So severe may be these sufferings, that patients sometimes say the distress caused by the discontinuance of the injection is greater than the pain for which it was used to remove.

Notwithstanding these drawbacks, it must be admitted such injections are often of inexpressible service, and will remove pain when every other means has failed.

Dr. Anstie, who warmly advocates this method of employing morphia, both to ease pain and to cause sleep, mentions the following as amongst its advantages: 1. Entire abolition of the depressing or irritant effects which are locally produced in the alimentary canal during the digestion of this or other remedies.

2. Far greater permanency of effect, in many cases, than can be produced by medicine swallowed.

3. Much greater rapidity of action.

By the same authority it is insisted "that anodynes and hypnotics ought never to be administered by the mouth in acute diseases attended with anorexia." He also discusses the question whether it is desirable and necessary to inject the anodyne at the place where the pain is felt, and arrives at a conclusion, with which the author agrees, but which is somewhat at variance to that of many other authorities. He believes "that for the pur-

pose of relieving local pain, or cramp in a muscle, injection at any indifferent spot will do everything that is required, except in a limited number of cases. These exceptional instances are those in which the neuralgia is of old standing, and there has been a marked development of very painful points." "It especially includes also those cases in which neuralgia is a secondary result of rheumatic affection of the nerve sheath."

The first injection should not be stronger than one-eighth or one-sixth of a grain, as a large quantity sometimes produces disagreeable and even dangerous symptoms.

The author may here add, that to him morphia has appeared, used hypodermically, to produce more of the intoxicating and exciting symptoms than when taken by the stomach; moreover it is not uncommon with the hypodermic injection of this alkaloid for great mental depression and much despondency to occur, perhaps in a greater degree than when it is given by the mouth.

If patients should fear the pain of the puncture by the injecting needle—though the insertion of this can generally be accomplished with very little suffering—the sensibility of the skin may be first deadened by the ether spray. Immediately the injection has been accomplished, sharp, smarting pain is felt, and soon, in many cases, a large flat wheal, like that of urticaria, arises. It is important to recollect these injections may leave behind them a hard horny cicatrix, on which account it is important the injection should be made in some part of the skin concealed from sight by the clothes.

Dropped into the eye, laudanum and solutions of morphia cause smarting, redness, and slight inflammation of the conjunctiva. They also cause the pupil to contract, although this is more thoroughly accomplished when opium or its preparations are administered in other ways. Opium, however, is never used when it is desired to contract the pupil, as this can be effected much more safely, easily, and thoroughly by the Calabar bean.

Opium wine is not unfrequently used to relieve the pain of conjunctivitis, and by its slight irritation to remove this disease.

In the mouth opium and its preparations have a bitter dis-

agreeable taste, by which they increase the quantity of saliva. Mixed with either tannin or creasote, opium is often introduced into the hollow of a painful tooth, and if the pain is produced by inflammation of the exposed pulp, such an application will often afford great relief.

After opium has been absorbed, if the dose has been at all a large one, it produces much disagreeable dryness of the mouth and throat. The same follows on the hypodermic injection of morphia, and is one of the most annoying consequences of opium.

The preparations of opium are not very often used for their effect on the throat, but the author thinks they may be, and that not unfrequently the good which follows their employment may be explained by their topical action on this part. Thus, for instance, many coughs are really owing to the condition of the throat, as in some cases of phthisis, where this part is red, inflamed, and even ulcerated, a condition which excites much irritation, and a frequent hacking cough, and which is especially bad at night. Under such circumstances the cough may be much abated by the topical application of morphia dissolved in glycerine, honey, or treacle, or some other viscid substance, which causes the solution to be retained some time in the throat. It is well known that the cough of chronic phthisis may often be best treated by directing the patient to retain a weak solution of morphia in glycerine, honey, or mucilage, for some time in the pharynx, when the irritability of these parts is blunted, and the cough allayed. The very excellent effect of morphia lozenges, which very slowly dissolve in the mouth, may be thus in some cases accounted for. Nay, opium or morphia, employed in the way described, and when the medicine remains for some time in contact with the structures just outside the larynx, appear to have a greater influence over coughs which are entirely dependent for their production on disease of the lungs, than when the medicine is quickly conveyed into the stomach. This fact has its explanation probably in the influence which remedies appear to possess over the organs of the body when applied to the orifices of passages leading to them.

A good formula for coughs is the following:—Morphia $\frac{1}{40}$ gr. spirits of chloroform 3 minims, in a drachm of honey or glycerine. This dose should be frequently repeated till the cough is allayed, and be taken at no other time, as the medicine only allays, but does not cure the cough.

Taken into the stomach, opium lessens both its secretion and movements, and, consequently, very considerably checks digestion. Here we have a sufficient reason why opiates should not be given shortly before or after a meal, unless, indeed, it be desired to diminish appetite or hinder the natural movements of this organ.

To control the appetite, opium is very usefully employed in diabetes when the appetite is inordinate. By diminishing the quantity of food which is eaten, the excretion from the kidneys is reduced, and in this way the troublesome thirst of this complaint is much abated. This remedy has, however, no further influence on the disease than this indirect one. Still in this way opium is often most serviceable.

These medicines not uncommonly excite nausea and vomiting; and this is very apt to occur in the morning following their administration on the previous evening. This unwished-for result may in some instances be averted by directing the patient to abstain from food for half an hour or an hour after waking in the morning. Some persons, however, retch and vomit, even on an empty stomach.

Opium, or its alkaloid, morphia, are usefully employed to remove the pain of many stomach affections, and by accomplishing this, they prevent the vomiting which may accompany them. It is thus useful in cancer, and chronic ulcer of this organ, and also in chronic gastritis from excessive indulgence in alcoholic drinks. In the last-named complaint, morphia in small doses, combined with tonics, and taken a short time before meals is very successful in removing the pain, the nausea, and want of appetite so often connected with this condition of stomach. Graves employed morphia in small quantities, combined with bismuth, in the treatment of gastrodynia with heart-burn.

The effects of opium on the intestines are similar to those on

the stomach, that is to say, it checks both secretion and movement. By these influences it constipates the bowels in health, and restrains diarrhœa in disease. The former effect is one of the most disagreeable consequences which follows on the use of opium, and is said to be much less marked when morphia is employed hypodermically.

From its power to control purging, opium, or its alkaloid morphia, is very constantly used, and with very great benefit, in both chronic and acute diarrhœa. In the acute forms it is useful after the irritant, which has excited the disturbance, has been expelled. It is, moreover, of very great use in the chronic diarrhœas of tuberculosis, of dysentery, and other organic diseases. To control these latter, it is an excellent practice to dissolve a grain of morphia in half a pint of water, and to take a teaspoonful of this every hour, or even oftener if the purging is urgent. Such a mixture is often highly serviceable in the troublesome diarrhœa of phthisis.

In typhoid fever, laudanum, in small doses, given at night time, may serve a double purpose, as, if there be much sleeplessness, with delirium, whether of the boisterous or muttering kind, opium will often produce sleep, and thus remove the delirium, while at the same time the diarrhœa will be much controlled or even checked.

Although so very generally useful in diarrhœa, there are certain symptoms or appearances of the motions which especially indicate its use. Thus when the food reappears in the stools but very little digested, or when a meal is almost immediately followed by an evacuation of the bowels, then opium may be considered to be especially indicated.

It may be here most conveniently mentioned, that there is a form of dyspepsia and diarrhœa which is most admirably treated by small doses of opium. In this disease there is probably increased peristaltic action of the stomach and intestines, and, consequently, food, soon after it is swallowed and in a very imperfectly digested state, is forced through the pylorus into the intestines, where, owing to its undigested condition, it acts as an irritant, and so excites the already too readily acting vermicular

action, and hence there occurs, very shortly after a meal, a diarrhœa of partially digested food.

In this disease there is felt much sinking at the stomach and a general feeling of hunger, both of which are relieved for a short time by food; but as the meal is only imperfectly digested, and is expelled through the anus long before it can be absorbed, the system is but imperfectly nourished, and, consequently hunger soon returns. The characteristic symptoms of this disease are, a sinking at the stomach, relieved for a short time by taking food, and the occurrence of an evacuation of partially digested food immediately after a meal, nay, even sometimes before it is finished, and generally at no other time. The diarrhœa is never very frequent, there being only four or five motions a day.

This complaint, which is perhaps the most common form of chronic dyspepsia in children of 6 to 12 years of age, may be immediately arrested by administering a few drops of tincture of opium a few minutes before each meal. The medicine probably checks the excessive muscular action of the intestines, and so enables the food to tarry in them a sufficient time to be fully digested. This disease may be still better treated with arsenic.

It is perhaps right here to add that although opium is very useful in diarrhœa, there are many forms of this complaint better treated by other remedies, combined or not with opium.

Colic of the intestines is well combated by small doses of opium or morphia frequently repeated. A grain of the latter, or a drachm of the former, to half a pint of water, may be employed, and a teaspoonful of this be given every ten minutes. The colic, when thus treated, generally speedily yields. As this painful affection is very generally accompanied by and dependent on constipation, a purgative should also be given, whose action the opium assists by relaxing the contraction of the intestines, which hindered the progress of the intestinal contents.

In inflammation of the peritoneum, and of the intestines, or in wounds of the abdomen, the bowels are well quieted, and their movements profitably checked by the employment of opium.

These remedies are administered by the rectum for a variety of purposes. It is then, usually as laudanum, mixed with an

ounce of decoction of starch, and at a temperature of 100°, or thereabouts, injected into this cavity. It is extremely effectual thus employed to check acute and chronic diarrhœas, and in those severe forms of this disease which sometimes carry off young children in a few hours, such an injection is often the speediest and safest way to control this dangerous symptom. The same injection often checks the purging of typhoid fever, or of tubercular ulceration of the intestines, or of dysentery, when other methods have failed. The same application is highly useful to remove pain of the bowels and also of the organs in the neighbourhood of the rectum. Thus the pain and frequent micturition of cystitis may very generally be much subdued by this injection. The pain of different diseases of the uterus may also be removed in the same way. Sometimes to accomplish the above-mentioned purposes a suppository of opium or morphia is introduced into the rectum as far as the finger can conveniently carry it, but it will be found the injection of the liquid preparation of laudanum and starch is much the more effectual.

Opium mixed with ointment of galls is an excellent application to painful bleeding piles, and to the rectum when there are fissures of the anus, which cause excruciating pain with each relief of the bowels. Mild purgatives should be at the same time employed.

Opium is, under certain circumstances, injected into the rectum, that it may be absorbed and affect the distant organs of the body. It is thus occasionally used to produce sleep, and it not unfrequently happens that thus employed it is effectual for this purpose when the ordinary method of administering it by the mouth has completely failed. In obstinate forms of sleeplessness, as occur in dyspeptics, or in convalescents from acute disease, when other means fail, the injection of laudanum by the rectum may be tried, and will often prove successful. Both Dupuytren and Graves assert this mode of giving opium is to be preferred to its administration by the mouth, in delirium tremens and in traumatic delirium.

The dose of laudanum when injected into the rectum must be determined by the purpose for which it is given. If employed to

relieve local pain a small quantity will generally be sufficient, but if given to produce sleep it must be employed in about three to four times the quantity which is administered by the stomach. At least so it is generally taught, but it will often happen that the ordinary medicinal doses will be, even when given by the rectum, amply sufficient to ensure sleep. The rectum must be well cleared out by a simple enema, or a purgative, before the injection is administered.

From the stomach or intestines the active principles of opium readily pass unaltered into the blood, for the same symptoms are obtained whether the opium be swallowed or injected under the skin.

The effects of opium on the system will now be considered.

Small doses in those unaccustomed to its use produce "a soothing and luxuriant calm of mind, followed in the course of forty or fifty minutes by a disposition to sleep;" if this does not happen, there is "general repose of both mind and body, undisturbed by pain." At first the pulse is quickened, but soon becomes slower. The mouth and pharynx are dry, and often perspiration breaks out on the skin. Larger doses, as from two to three grains, often produce much more decided effects. There is at first much excitement, and the head feels hot and light, with noises in the ears, and closely contracted pupils. The ideas are confused and extravagant, nay, decided delirium may occur; the pulse, at first full and frequent, soon becomes slow. The head feels heavy and full, and the senses lose their acuteness. Sleep soon follows, which is often heavy and even stertorous, and accompanied by most disagreeable dreams.

The susceptibility of persons to the action of opium differs very greatly, as also do the symptoms it produces. Some are so easily affected by opium that even small quantities endanger their lives; such an extreme susceptibility is, however, not common. Then, again, the effects of opium may be very various. In some it produces only agreeable feelings and ideas, whilst in others both are most unpleasant. In some the stimulant effects are most prominent, in others the narcotic.

If taken in poisonous quantities, the primary stage of excite-

ment is very short, and narcotism rapidly supervenes. There occur much giddiness and feeling of oppression, with a strong and irresistible desire for sleep. There may be both nausea and sickness. The sleep soon passes into profound insensibility, when the breathing grows slower and slower, and more and more shallow, till it ceases. From the effect on the breathing the face is livid and bloated, the veins tumid and swollen. The pulse, at first full and strong, becomes small, feeble, and thready. The pupils are very greatly contracted. The power of swallowing is gradually lost, the pupils become insensible to light, and the muscles relaxed, and the patient cannot be roused, for he is profoundly insensible. Mucus collects in the throat, and at last the breathing ceases, when death occurs.

Patients may die in a state of collapse and not from asphyxia, though paralysis of the muscle of respiration is the usual cause of death.

Occasionally there happens in opium poisoning, diarrhœa, diuresis, convulsions (most common in children), lock-jaw, dilated pupils, or one is dilated while the other is contracted, also itching and dryness of the skin.

Opium poisoning in some respects simulates apoplexy, drunkenness, and uræmic coma.

From apoplexy it may be distinguished very generally by attention to the following points: history of the attack, smell of breath and vomited matters, state of the pupils, and age of the patient. In apoplexy the pupils are very generally dilated, and are often unequal, and this affection rarely happens to young people.

It is only those cases of profound intoxication which put on the appearance of opium poisoning, and the similarity is then only a superficial one. In both affections there is great insensibility, but if the person can be roused, when drunk they answer questions incoherently, but when poisoned by opium, although they are slow to speak, yet their answers, when given, are rational and to the point. The breath and vomited matters will very often tell if alcoholic drinks of any form have been taken, but it must always be recollected that suicides not uncommonly take the

laudanum in beer or other drinks, but when this is the case the smell of the laudanum may mostly be detected through that of the liquid with which it is mixed. With persons poisoned by opium the pupils are much contracted. When such a state of insensibility as is here understood to occur is produced by alcohol, the pupils are widely dilated. The early symptoms of the attack will also prove sufficient to decide between poisoning by opium or alcohol.

Uræmic coma may occur very suddenly and without any, or scarcely any, dropsy. To distinguish such a case from opium poisoning, the history of the attack should be ascertained. Persons with uræmic coma can generally be partially roused, when some information may be obtained from them. An analysis of the urine, moreover, may throw much light on the case, while the state of the pupils may remove any doubts of poisoning by opium.

It is necessary to state that effusion of blood into the pons varolii will produce appearances almost identical with those of opium. Thus, in both there is profound insensibility with closely contracted pupils, and slow, stertorous breathing. It may be impossible to distinguish between these two conditions till a post mortem examination reveals the real cause of death.

Treatment of poisoning by opium—*rouse the patient and keep him constantly moving to prevent sleep*, strong coffee, *cold effusion to the head*, and, if necessary, artificial respiration.

It is a not uncommon practice when persons are recovering from the effects of a poisonous dose of opium, to administer to them brandy or wine, with the hope of still further rousing them and removing their sleepiness. The author has often watched the action of alcohol on such people, and has always found it to greatly increase their sleepiness.

It is necessary to mention very cursorily the habit of opium eating largely indulged in by many of the inhabitants of Asia, and by many more of our own island than is generally thought. With some persons this practice, although carried to a very great extent, produces neither physical nor mental weakness, while with others the body wastes, and they grow physically and mentally

weak, are irritable, fretful, and desponding, especially so when the opium is withheld; the memory is much impaired; the skin becomes sallow, but, strange to say, in many cases the bowels are not constipated.

The horrors which opium-eaters suffer when the drug is withheld are well known, and need not be dwelt on here, and so great are these sufferings that few have sufficient resolution to relinquish the habit. The utmost that can be done is to cease increasing the dose, or very gradually to diminish it. The amount of opium taken is often enormous. De Quincy took 320 grains daily.

When not indulged in to excess, the habit is a comparatively harmless one, and perhaps not more prejudicial to health than tobacco-smoking. Thus, the Chinese are almost universally addicted to the habit of opium-eating, and yet they are an intelligent and industrious race.

The great purpose for which opium is given is to produce sleep, and when judiciously and properly employed it can, by accomplishing this object, save life, even when this is in the greatest jeopardy.

In fevers, whether inflammatory or specific, sleeplessness is often one of the most dangerous symptoms, as without sleep the strength is quickly worn out. Such want of sleep produces either noisy and furious delirium—as is frequently seen in typhus fever—or wandering and muttering, with picking of the bed-clothes, twitching of the muscles, and great prostration. In either case opium cautiously given, so as to cause sleep, may save an almost hopeless life. Where the delirium is of the furious kind, it is good to combine the opium with tartar emetic, as this combination more speedily and effectually calms the excitement, and produces sleep. Graves gave three or four drops of laudanum and one-sixth to one-eighth grain of tartar emetic every two hours till tranquillity and sleep were produced. He increased the tartar emetic when the delirium was very great and very boisterous.

Where there is muttering delirium, with muscular tremors and great prostration, laudanum may be given alone with the most

signal benefit. The following is the method the author has seen practised with great success:—A grain of morphia, or a drachm of laudanum is mixed with four ounces of water, and of this mixture a teaspoonful is given to the patient every five or ten minutes, till three or four doses have been administered. If by that time the patient be not asleep, the medicine should be discontinued for half an hour, to see what its effects will be. If, after the lapse of this time, there be still no sleep, a few more doses should be given in the same way. By this method calm, refreshing, invigorating sleep can frequently be produced, which may last for several hours, and out of which the patient wakes refreshed and free from wandering, while the appetite and digestion are considerably strengthened, and the skin made comfortably moist.

Those who have watched the action of opium on persons in the above-described critical condition (who are greatly prostrated, and in whom there is twitching and tremor of the muscles, with quivering of the dry brown tongue), must have been struck by the fact that its use enables patients to progress favourably with less alcoholic stimulant than would otherwise be required,—for by the sleep the patient is naturally refreshed and strengthened,—an immense advantage, as there then remains in reserve, should occasion require it, recourse to a larger quantity of stimulants. It need scarcely be said that to such persons brandy or wine must be freely given with the laudanum.

So critical a time is that just described, and so important is it for the medicine and stimulants to be regularly and properly administered, that it is always advisable for the medical man to sit beside the patient and conduct the treatment himself for the few hours over which it extends.

In delirium tremens, opium, by producing sleep, does great service. If the delirium be boisterous, the strength of the patient great, and his pulse full, then tartar emetic, or tincture of aconite, may be added to the opium. It is convenient to administer the opiate with porter or spirits, which apparently heighten its action, while this combination is more readily taken by the delirious patient. It has been already mentioned that

opium sometimes in this disease acts more efficiently when given by the rectum.

Acute mania may also be advantageously treated in many instances by opium and tartar emetic.

When opiates are employed as hypnotics, attention should be paid, as was well pointed out by Dr. Graves, to the time of their administration, and the usual time for sleep, or when the patient feels inclined to doze, should be ascertained, and the medicine be so given as to produce its effects when nature is herself tending to the same end. With some persons, as those who suffer from chronic wasting disease accompanied by hectic, there is no inclination to sleep till the early morning hours. The opiate should then be given very late at night. With other persons in a less serious state of health, or who are convalescent from acute disease, but who are troubled with sleeplessness, if it be considered desirable to overcome this with opiates, the usual time of retiring to rest and of falling to sleep should be learned, and the medicine so given as to produce its effect at that time.

Opium mostly produces its narcotic effects about one or two hours after it is administered.

The chronic sleeplessness which occurs in some people without any very notable disease, should not, if it is possible to do otherwise, be treated with opium, but the cause of it be removed. Dyspepsia and uterine derangements are constant causes of sleeplessness.

Opiates are also employed to relieve pain, and although capable of doing this in most cases, yet the practice is not a good one, unless all other methods have been tried and have failed, for the opiate soon loses its influence, and must be given daily in larger quantities until the patient quickly becomes accustomed to its use, and cannot, without great discomfort, discontinue it, even after the pain has been permanently removed.

This habituation of the system to opium is sometimes acquired by endermic injection of this medicine, if the treatment be continued for some time, and it has happened the sufferings experienced on the discontinuance of the injection have been greater than those from the pain it was given to relieve.

To relieve pain and to ensure sleep, opium is often of very great service in acute rheumatism.

As an antispasmodic, opium is often of signal use. Its action in this respect, as well as its narcotic power, is much increased if it be given with a stimulant, as alcohol, ether, or chloroform. These last-named medicines appear even to heighten the strength of the opiate.

Laudanum or morphia, when used in the following way, is of extreme service in the convulsive stage of whooping-cough. Sufficient of these substances is to be given to the child to produce very slight heaviness, and this state is to be maintained by a continuation of the medicine. This can be accomplished by one-fiftieth grain of morphia every three or four hours, or a proportionate dose may be given each hour. Of laudanum, a quarter of a drop to two drops, according to the age of the child, must be given every hour. By this treatment the whoop may be, in many cases, very quickly removed, and the severity and frequency of the cough much diminished; but if there be present any irritation, as of teething or of worms, or if there be tuberculosis or much bronchitis, then this remedy, like most others, produces little or no influence on the disease. In employing it, therefore, the child should be protected from the cold, and, if the weather is severe, must be kept in-doors in a warm room. This treatment, though very successful, is, the author thinks, inferior to that by lobelia inflata.

Opium and its preparations may be beneficially used in renal and biliary colic. A teaspoonful of the mixture before mentioned, given every quarter of an hour or ten minutes, will quickly, in most cases, relax spasm and relieve pain.

Opiates are also used with advantage in some cases of asthma, although some persons afflicted with this disease, have the paroxysms of dyspnœa brought on by morphia.

They are also used in spasmodic stricture.

Opium and its preparations are reputed to check the secretion from all the mucous membranes of the body, and on account of this property they are given in bronchitis when there is an abundant secretion of mucus and pus.

They also promote perspiration, and are employed as diaphoretics.

The power of opium in small doses, taken at night, to cut short a cold in the head, if resorted to at the very commencement of the attack, is ascribed by some to the influence it exerts on the skin. Dover's powder is very generally employed in such colds, but it is well known that two or three drops of laudanum taken at bed-time, is often sufficient to terminate at once a threatening attack of cold in the head. It is useful to assist the action of the opium by a glass of hot grog. Laudanum, more especially when mixed with some tincture of nux vomica, may be very usefully employed to remove some of the distressing symptoms which afflict hysterical women or nervous, over-worked men. With such, mostly in women about 40 or 50 years of age, there occurs a feeling of great weight and heat on the top of the head, with frequent flushings of the face, and suffusion of the eyes, also hot and cold perspirations, and sometimes shooting pains passing up the back of the head—it may be fixing on one brow—with much heaviness and torpor after meals. In overworked and anxious men there may be a feeling as of a tight cap on the vertex, or dull aching pain in the same part, with inability to fix the attention, and much depression of spirits.

The occurrence of these symptoms may generally be traced to a variety of causes, as flatulent dyspepsia, heart-burn, uterine derangements of various kinds, or unhygienic conditions of life. When such causes can be discovered, they must be treated and removed. But it may happen that this proves impossible, then the above symptoms may, by the treatment recommended, be very generally dissociated from the disease producing them, and the patient much relieved. A drop of tincture of laudanum, with two of the tincture of nux vomica, repeated three or four times a day, is the mode of administration to be adopted in such cases.

Morphia, in some people, produces an eruption, sometimes like that of measles, at other times like that of nettle rash. It may be accompanied by the most distressing itching, which is then sufficient to counteract the anodyne properties of the medicine.

Tincture of opium in large doses (ʒj) is recommended in

flooding after parturition, when the loss of blood is great and there is much exhaustion of the uterus. It is advised to administer it mixed with brandy.

The influence of opiates on the urine of diabetes has been already mentioned.

In health the preparations of opium diminish the water and urea of the urine. This they probably accomplish by lessening the appetite and hindering digestion. Morphia passes out in part by the urine.

Under the influence of opium the urine, in some cases, is retained in the bladder for several days.

It is further of importance to bear in mind, that the active principles of opium pass out with the milk and thus a child at the breast may be dangerously affected by opium given to its mother.

It is necessary before this section ends to mention the circumstances which modify the action of opium. These are, individual peculiarities, disease, age, and custom.

Of individual peculiarity, we have already spoken.

Disease, as is well known, often enables persons to tolerate very large doses of opium. This is especially the case if pain is present and is severe.

Age influences the action of all medicines, but in an especial degree of opium.

That medicines should in the same dose act far more powerfully on the young than the old, is no more than would be expected; for medicines, after their absorption, are mixed and diluted with the blood, and this dilution is, of course, greater in adults than in children, as the mass of blood is far greater in the former than in the latter. Medicines, it consequently follows, are conveyed in a much weaker state, because much more diluted, to the organs of full-grown persons than in those of young children. Other things being equal the dose of a medicine must be proportioned to the weight of the individual. The great susceptibility of young children to the action of opium is, however, far greater than the above remarks can explain, and so great is the power of this drug over persons of tender years, that great care must be shown in administering an opiate.

The influence of custom on the action of opium has been already mentioned.

Morphia is generally considered to act on the body somewhat differently to opium. It is said to be less stimulating, and to produce less headache and nausea.

Narcein has recently been much recommended, as superior to morphia, as a hypnotic and sedative, and is said to produce no pain in the head, to increase the perspiration in a smaller degree than morphia, to produce no constipation, nay, in large doses to purge. It seldom produces vomiting, but often nausea and loss of appetite. It has been computed by one observer that narcein is four times weaker than morphia.

It is stated this is the only alkaloid of opium which does not produce convulsive movements.

Claude Bernard has been led by his investigation to arrange the constituents of opium into three classes, namely, the soporific, the convulsant, and the toxic. The following is the arrangement he has proposed. The substances are placed in the order of their activity:—

Soporifics.	Convulsants.
Narcein	Thebaia
Morphia	Papaverine
Codeia	Narcotine
	Codeia
	Morphia
	Narcein

Toxics.
Thebaia
Codeia
Papaverine
Narcein
Morphia
Narcotine

For some further remarks on the action of thebaia, codeia, narcotine, and morphia, see the article on Strychnia.

NUX VOMICA.
STRYCHNIA.
BRUCIA.
THEBAIA.

The three alkaloids just named appear to have a similar action on the cord, and hence, for convenience sake, may be grouped together, but while this is true it must be stated that strychnia is more powerful than brucia, and brucia than thebaia. The remarks which will follow mainly apply to nux vomica and its alkaloids, as thebaia has not yet been put to any therapeutic application.

It was formerly an occasional custom to blister the skin over paralysed muscles, and to apply strychnia to the raw surface, with the hope of obtaining a greater effect on the diseased muscles than when the medicine is given in the ordinary way by the mouth. This method has now fallen into disuse, and hypodermic injection has to some extent taken its place.

By Dr. Anstie the hypodermic injection of strychnia in $\frac{1}{120}$ grain doses has been recommended to relieve the pain of cardialgia and gastrodynia, and he knows "at present no such remedy for gastralgia as this."

The preparations of nux vomica possess an intensely bitter taste, and like other bitters excite an increased production of saliva.

In the stomach they produce a feeling of hunger, which leads to an increased consumption of food, but there is no evidence that strychnia or any other bitter substance can in a healthy person increase digestion. Like other bitters, and perhaps in a superior degree, these preparations can, by their slight irritant action, set aside any departures from health of the gastric mucous membrane, and under such circumstances promote digestion. The action of these preparations, and especially of the tincture of nux vomica, which is by far the best and most agreeable for this purpose, can be well seen in persons whose digestive canal is in the following condition. In the course of chronic diseases, as bronchitis or dilated heart, or cirrhosis of the liver, the tongue is

not unfrequently thickly coated with a white fur, and the state of digestion indicates the stomach is in a similar condition—that it is affected with a chronic catarrh. By the exhibition of one or two drops of the tincture of nux vomica in a teaspoonful of water every two hours or oftener, in twenty-four to forty-eight hours the tongue not unfrequently becomes clean, and the appetite and digestion very greatly improve.

We can thus clear the way for the administration of nourishing substances in persons with such a stomach at critical times, when support to the body by food is of extreme importance. Again, at early convalescence, when the tongue still continues coated, and when the digestion is weak, much improvement in the condition of the digestive organs can be obtained by the use of the tincture of nux vomica, as above explained. We thus pave the way for stronger tonics, and a more liberal diet.

The annoying flatulence and the indigestion which occurs in mechanical obstruction of the circulation in the digestive organs, as from cirrhosis and dilated heart, may be much mitigated by this treatment; nay, flatulency of any kind may be more or less successfully treated by nux vomica. Heart-burn also frequently yields to small quantities of the tincture given three or four times a day.

The following group of symptoms are most admirably met by tincture of nux vomica, namely, weight at the pit of the stomach after food, with acidity and heart-burn, and some flatulence, to which are added heat and weight at the top of the head. These symptoms, which often occur together, usually in women, and especially in those of middle age, may generally be at once removed by the employment of five drops of the tincture of nux vomica three times a day, and each dose is to be taken about a quarter of an hour before food. The heat and feeling of weight on the top of the head, even when occurring alone without any gastric disturbance, may almost without fail be removed by the same treatment.

In acute gastric catarrh, accompanied by "sick headache," the action of tincture of nux vomica is often very conspicuous. Many persons are greatly troubled with this complaint, which may

arise, apparently without any cause, or can be traced to some error in diet, or constipation. It often happens the headache is the most prominent symptom, and the sickness and nausea is very slight, nay, there may be a mere feeling of qualmishness. On such a disease the nux vomica acts most excellently. The way to obtain the desired results is as follows:—A drop of the tincture in a teaspoonful of water should be taken every five or ten minutes till eight or ten doses have been swallowed, and then be continued at longer intervals. By such a treatment these headaches, with the confusion of sight, if this is present, may be quickly relieved, and, in a few hours, removed, even when they usually continue severe all the day. It is important in employing this medicine for the purpose just mentioned, that too large doses should not be taken at a time, and that the medicine should be sufficiently diluted to give it only a slightly bitter taste.

The chronic dyspepsia of an irritant kind, with a coated creamy tongue, through which red prominent papillæ project, often yields to nux vomica.

MANCHESTER ROYAL INFIRMARY

These substances, and especially the tincture or extract of nux vomica, have long been employed to remove constipation, habitual or otherwise. Sometimes the extract, variously mixed, with other remedies, as rhubarb or colocynth pill, is taken daily, a little time before dinner, and then aids both digestion and the proper unloading of the bowels. Or the same effect can be obtained in many instances, by the employment of one or two drops of the tincture twice or three times a day. This small quantity will prove, with many people, amply sufficient to ensure daily one comfortable motion. This treatment, when successful, is greatly superior to that by purgatives, as after a time it accomplishes a cure.

It appears, in cases of constipation, from our want of knowledge of the exact circumstances which indicate its employment to be capricious in its action, and it is as well, therefore, not to be too sanguine of its success. In some cases it answers beyond all expectation, while in other apparently similar cases it as completely fails. If the sluggishness of the bowels has been of long continuance, and is very obstinate, the patient should be directed to

take, occasionally, in the morning, half a tumbler of some purgative natural water, to assist the nux vomica, which latter medicine, in a little while, will be able to effect what is desired without such aid. If the tardy action of the bowels is owing to a too small supply of bile, and when, therefore, the motions are pale in colour, the preparations of nux vomica fail of their purpose, and other medicines are more appropriately given.

Strychnia, as Mr. Savory has shown, is much more poisonous when injected into the rectum than when swallowed. This difference between the stomach and rectum is not owing to the digestion and destruction of the alkaloid by the gastric juice; as Mr. Savory has proved, this secretion has very little, and probably no power over strychnia.

This alkaloid, strychnia, and also the other active principles of nux vomica, quickly enter the blood, as is shown by the rapidity with which poisonous doses produce their symptoms. The alkaloid can, moreover, be extracted from the blood and urine, a conclusive proof of its absorption into the blood.

When a large and poisonous dose is taken, symptoms very closely resembling those of tetanus are produced. There is first experienced general uneasiness, with restlessness and soreness of the limbs. Shooting pains, like shocks of electricity, are felt in different parts of the body, often first in the back, and down the arms and legs. Soon tetanic and paroxysmal contractions of the muscles occur, which rapidly grow worse, till by them the body is made rigid, while the paroxysm lasts. The respiratory movements are then quite arrested, and in consequence the face becomes bloated and livid, the jugular veins stand prominently out in the neck, the eyes are staring and prominent, the jaws are firmly clenched, and the pupils dilate. Each attack of spasms lasts for a few seconds to a minute or more, and then generally ceases altogether for a time. The mind is all this time quite unaffected, and the patient's sufferings are agonizing. The tetanic spasms may be excited by the most trivial causes—a breath of air, a slight noise, or movement of the bed-clothes, will arouse them. Death, when it occurs, is rapid, and if the patient survives two or three hours sanguine hopes of his recovery may

be entertained. A fatal termination may be due either to exhaustion from the repeated convulsions, or to asphyxia from spasm of the muscles of the chest.

Brucia and thebaia and also to some extent, codeia, act on the body in the same way, as far as experiments on animals will permit us to judge of their effects on man.

The symptoms of strychnia poisoning differ from those of tetanus in the following particulars:—They are from the first very strongly marked, and rapidly reach their worst. There occur perfect intermissions, and death soon happens, or the symptoms decline, and the patient recovers.

Treatment of poisoning:—*Stomach pump. Animal charcoal. Tannin.* Solution of iodine. *Chloroform inhalation.* Injection of curare, or of methyl and ethyl compound of strychnia, of brucia, or of thebaia. Artificial respiration. Fats.

These convulsions are produced by the action of the poison on the spinal cord. The nerves, muscles, and brain are probably unaffected by it. The loss of contractility observed in muscles after poisoning by strychnia has been shown by Kölliker to be due to their exhaustion by the powerful spasmodic contractions to which they have been subjected.

Harley's experiments show the poison acts on all parts of the spinal cord. Its influence on this organ appears to be a twofold one. It dilates the vessels, and thus increasing the supply of blood, augments the activity of the functions of the cord. But it is supposed, apart from this property of dilating the vessels, to have a direct stimulating influence on the spinal cord, although, as Harley has shown, it can act only through the blood, and does not, as was formerly supposed, exalt the functions of this organ when all its vessels are separated from it, and when a solution of strychnia is brought into direct contact with its elements.

Nux vomica, or its alkaloid, is most generally, and often with great benefit, employed in motor paralysis. By some persons it is administered with the view to excite slight twitchings in the paralysed muscles, and by these contractions to maintain their nutrition and prevent their wasting. It is recommended by Dr. Brown-Sequard to use these medicines in those forms of

paraplegia dependent on softening and wasting of the cord. This occurs if the vessels are degenerated and partially blocked up, when the quantity of blood conveyed to the cord is diminished. It is supposed the strychnia will dilate the vessels, and so increase the supply of blood in the degenerated tissues and avert their further destruction.

Paralysed muscles are sooner affected by strychnia, than those not paralysed.

Strychnia is said, in medicinal doses, to strengthen the beating of the heart. It has been shown that the heart of animals poisoned with strychnia ceases sooner to contract after death than that of animals destroyed by mechanical means, and further, if a frog's heart be placed in a solution of strychnia, it ceases to beat sooner than another placed in simple water. It is not said whether the organs cease to contract in the systole or diastole. Harley states if a solution of strychnine be dropped on a heart its muscles become tetanic. The same authority states, as proved by his investigations, that both strychnia and brucia possess the power to lessen in the blood the absorption of oxygen, and the production of carbonic acid, in other words, it lessens the respiratory function of the blood. Thus, if either of these alkaloids be mixed with blood recently removed from the body, the amount of oxygen it absorbs, and of carbonic acid it gives off, is less than that of blood to which they have not been added. It has been concluded from this fact that these alkaloids must possess the power to lessen in the body the respiratory function of the blood. (Is it not probable that most things which alter the physical or chemical condition of the blood will lessen its respiratory function?)

When strychnia is given to rabbits with young it causes them to abort, and it has been hence concluded to possess a direct influence on the uterus, but there is no other evidence to confirm this conjecture than that just given.

Nux vomica is useful in prolapsus ani. If there be constipation, then it may be added to a purgative, as tincture of rhubarb. If there be diarrhœa, this should be checked, when the prolapsus will probably cease; but if not strychnia will

generally quickly succeed in curing the child of this troublesome complaint.

These preparations, and especially the tincture, are often of much use in the so-called hysteria which is met with in middle-aged people. It appears in many cases to control the distressing flatulence which is commonly connected with this state. The same medicine is able to remove in such the feeling of heat and weight on the top of the head, and, with less certainty, flushings of the face and hot and cold perspirations. It is still more effectual when combined with small quantities of laudanum.

A peculiar effect of strychnia has been noticed by Dr. Anstie. With some people it produces symptoms closely resembling intoxication. He has observed unsteadiness of gait and perversion of the intellect, with a meaningless smile. The author on one occasion was able to connect a peculiar wandering delirium at night with the employment of strychnia. In this case there were no tetanic twitchings.

Dr. Anstie recommends strychnia for persons who are troubled with cold hands and feet. He is of opinion the medicine promotes capillary circulation.

Persistent erections have occurred after its administration, and this has led some medical men to give the medicine in impotency and spermatorrhœa.

In paralysis of the bladder, such as occurs in old people, who cannot hold their water, which constantly dribbles away, strychnia is sometimes employed with much benefit. It may be useful in the incontinence of urine of children.

Strychnia is separated in part, at least, by the kidneys. Its influence, if any, on the urine, has not yet been ascertained.

Quite recently, Drs. Crum Brown and Fraser, have published, in a remarkably able paper, some experiments they have made with methyl and ethyl compounds of strychnia, brucia, and thebaia. Their results are most astonishing. These substances, while retaining most of their chemical properties—as they give the ordinary reactions of strychnia, brucia, and thebaia—have their physiological action on the body completely altered. These observers experimented with iodide of methyl-strychnium,

sulphate of methyl-strychnium, and with the nitrate and hydrochlorate of the same base. Also with iodide and sulphate of methyl-brucium, and with iodide and sulphate of methyl-thebaium. They found, as we have said, these new compounds have an entirely different action on the body, from the alkaloids from which they are prepared.

Strychnia, brucia, and thebaia, as we have already stated, affect the cord, and produce, according to the dose, more or less severe tetanic convulsion. But these substances, when converted into the ethyl and methyl compounds, no longer act thus, but produce general paralysis of the body, which action these experimenters have shown to depend on a paralysis of the ends of the motor nerves. That, in fact, these new compounds act on the body as the curare poison.

They further show these new substances differ much from strychnia, brucia, &c., in their action on the heart and muscles, for the heart after poisoning by the methyl or ethyl compounds continued to contract naturally for a long time, while the muscles for many hours continued flaccid, contractile, and alkaline.

These observers further experimented on cordeia, morphia, and nicotia.

At the conclusion of their treatise they say—"The change in the character of the physiological action is remarkably illustrated by strychnia, brucia, and thebaia, whose purely spinal stimulant action is converted into a paralysing action on the periphery (end organs) of motor nerves; it is apparent in codeia and morphia, whose convulsant action is also converted into a paralysing action on motor nerve end organs, and whose hypnotic action is apparently altogether destroyed in the case of codeia, and certainly greatly diminished in that of morphia; and it is obvious, though less so than with the others, in the case of nicotia, whose convulsant action is diminished, if not altogether removed. We may conclude from these facts that when a nitrile base possesses a strychnia-like action, the salts of the corresponding ammonium bases have an action identical with that of curare."

"It is well known that curare and strychnia are derived from plants belonging to the same genus, and it is, therefore, interesting to observe such a relationship. It may not, however, be altogether superfluous to add, that strychnia, brucia, and the other spinal stimulant alkaloids examined in this paper, have not been converted by chemical addition into curarina—the active principle of curare. The action of the methyl derivatives of these bases is of precisely the same character as that of curare, and they possess the same peculiarity of slow absorption by the mucous membrane of the digestive system, but the degrees of their activity are very different. If we confine our attention to the salts of the methyl derivatives of strychnia, brucia, and thebaia, where the action is uncomplicated, we observe they form a series in which the fatal dose varies for each, while this dose, in the case of the most active of the three, is considerably above that of curare, and greatly above that of curarina. Besides, curarina has a characteristic colour re-action that belongs to none of these bodies, and the latter further prove this dissimilarity by each of them possessing special colour re-actions, by which they may be distinguished from each other."

LOBELIA INFLATA.

This remedy has been both highly praised and as strongly condemned, in certain diseases to be immediately mentioned, for in some persons' hands it has answered beyond expectation; but with others it has yielded nothing but disappointment and failure. This discrepancy may be reconciled, for the medicine has been given in very different doses by the two sets of authorities referred to. Unless given in very considerable doses—doses considered, without any foundation, as poisonous by many people—this remedy will be without any effect. It is considered by many to be a highly poisonous and dangerous drug, which must be given with much caution and close watching, but such as will appear in the sequel is not the case.

This remedy will be found of great service in many cases of

asthma, whether this be dependent on visible structural changes in the lung or not. The indication for the medicine is paroxysmal dyspnœa, and especially of that kind which occurs at night, apparently without any provocation, and lasts many hours, or, it may be, the whole night. If the difficulty of breathing occurs only on exertion, or from a bad fit of coughing, lobelia will generally be without effect. As this medicine is only remedial, and not curative of the conditions which cause the dyspnœa, it should only be given when the patient is troubled with a paroxysm ; but immediately on any signs of an approach of one, the medicine must be begun. It may be taken in doses of a drachm of the tincture (not the etherial tincture) every hour—or even every half hour—and if drops may be taken every five or ten minutes till the dyspnœa gives way. It is better to adopt the latter plan, as then, if sickness or depression occur, the medicine can be discontinued. The great drawback to this medicine is its uncertain action on patients in the following particulars, as some are made sick and faint by doses which do not at all affect others, hence the desirability of employing small doses frequently repeated. It is well to inform patients of the possible occurrence of sickness and faintness, which may make them feel very ill ; but these symptoms soon disappear, and never, as far as the author has seen, become serious or dangerous. Thus, he has repeatedly given two-drachm doses without any dangerous consequences, but generally with a feeling of sinking at the stomach with nausea, and not unfrequently vomiting. It should be given with caution if there be heart disease, as then the pulse may be made irregular, and very weak. The dyspnœa which in emphysematous people accompanies capillary bronchitis may be much allayed by lobelia inflata.

This medicine is of still greater service in whooping-cough ; but in this disease, also, it is necessary to give large doses, which are always well borne by children, for in no instance has the author seen any symptoms—neither nausea, nor vomiting, nor faintness—occur after the large doses to be immediately recommended. In this disease lobelia is useful in the spasmodic stage, and when given to children will generally, in two or three

days, reduce the frequency of the attacks to one-half, and at the same time lessen their severity. Its influence on the cough is well seen by the speedy subsidence and disappearance of the whoop. Like all other remedies for whooping-cough, it acts best in uncomplicated cases, and when the weather is warm and mild. It is necessary, in order to obtain the good effects from lobelia, to confine the child to a warm room, if the weather is cold, and the winds cutting and sharp; under other circumstances, the time should, as much as possible, be spent in the open air. In treating this disease, the author orders for a child two years old ten minims of the tincture of lobelia every hour, and an additional dose to be given each time the cough comes on, if there be sufficient warning to accomplish this. By this treatment very generally the severest attacks are immediately made much milder, while, as has been said, after a very extensive use of the medicine in these doses, the author has never seen it produce any of the symptoms which are witnessed in adults, and hence it must be concluded lobelia is better borne by children than by older people.

It is true sometimes the medicine feels warm to the throat; and with very young children there may be some trouble to make them take it, but such occurs with all medicines when given to young children. With such, this remedy, in common with all others, appears to have less influence over the disease than when this occurs in older children. This disease, as is well known, is very obstinate and dangerous in children only a few months old, and in such the lobelia often appears to do less good. Even in such young children the author gives five minims of the tincture every hour.

This medicine, without doubt, has a most remarkable power over the paroxysmal cough, and so makes the disease much milder and less dangerous; but whether it shortens this is a more difficult question to answer.

Lobelia has been praised in bronchitis; the author has tried it in several cases of this disease, but while it removed any dyspnœa if this was paroxysmal, it appeared to have no power over the bronchitis itself. It has also been employed in laryngismus stridulus and in croup.

It may not be out of place before concluding this article to state that in every instance, while trying the effect of this drug, it was given alone, as it is only by such a method any exact knowledge of the effect of drugs can be obtained.

CANNABIS INDICA.

All persons are not similarly affected by Indian hemp, and race and climate have been supposed to modify its influence. The following is an enumeration of the symptoms which may be produced by this drug. Its effects are most marked on the mind, whose functions it perverts more or less, and in various ways. It generally produces a pleasurable intoxication, and the person becomes talkative, or sings, or perpetually giggles and exhibits much merriment. They are possessed with a feeling of great happiness and contentment, and ideas of a pleasing kind pass with much rapidity through the mind. These are sometimes unconnected and immediately forgotten, but in other instances are remembered on the return to natural consciousness. Objects often assume very grotesque appearances, and excite much laughter in the person who has taken the drug. After a time sleep is generally produced, which is often accompanied with delightful dreams. There may be pain in the head, and "a feeling as of the brain boiling over, and lifting the cranial arch like the lid of a tea-kettle," has been described. General sensibility is also affected, and there is early felt pricking in the feet with numbness, often pleasurable in kind; there may be a feeling of burning heat when the skin is pressed, and after a time there is complete anæsthesia to such an extent that while standing there may be no consciousness of touching the ground. The muscular sense even is lost, and pain lessened or removed. Sometimes there is produced perfect catalepsy. Under the influence of the drug there is often occasioned a feeling of great hunger, which is not appeased by food. The pulse is said on some occasions to be at first rather increased in frequency and strength, but neither it nor the

breathing are much altered. The pupils contract to light. There is sometimes strong sexual desire.

Such are the symptoms which have been noticed to occur when Indian hemp is eaten, but they do not all occur in the same person, but are variously combined. It is necessary to state that on some occasions the sensations have been anything but pleasant, for the drug has produced nausea and vomiting, great thirst, frequent weak and intermittent pulse, with disagreeable feelings and ideas.

This drug is generally considered to act somewhat like opium, but to differ from it in not producing nausea, constipation, nor headache. This remedy is not often employed as an hypnotic, neither is it very successful when given with this view.

It has been given in a variety of diseases, but has not yielded the good results which were expected of it. It has been used in neuralgia, also in whooping-cough, asthma, and menorrhagia. It appears to be useful in some cases of hysteria. It enjoys with some a high reputation as a diuretic in acute and chronic Bright's disease, and is considered to be especially indicated when there is blood in the urine. It is further said to relieve persons affected with dysuria and strangury, and to be useful in retention of the urine, dependent on paralysis from disease of the spine. It is used occasionally in gonorrhœa.

The author has on numerous occasions seen headaches, presenting few or many of the following symptoms, very greatly relieved by cannabis indica. There is dull throbbing pain situated over one brow, most generally the right, which may be felt also around the eye, and even in the eyeball itself, when the sight is obscured, and there may be some lachrymation. These attacks may come on once or twice a day, and last a variable time, from a few minutes to several hours, or they may be repeated every few minutes. There is often at the same time a dull, aching and continuous pain in the same part of the head. The paroxysms of pain leave the skin very sore, and even so exquisitely tender that the patient cannot lay the head on the pillow from the pain it causes. These pains of the characters above described, may after a time spread over the whole head, and even attack the muscles of

the back of the neck, which become so tender and painful that movement of the neck is quite impossible.

The whole head is then exquisitely tender. Most generally these attacks are worse in the day, but are occasionally so at night. They are certainly not due to hysteria, as they not uncommonly occur in strong and vigorous men, and they are not due to syphilis, as in many of the cases observed by the author there was no history of such a disease. These headaches very generally speedily yield to Tr. Cannab. Indica in three drop doses, given every four hours. It is important not to exceed this dose, or the good results may be lost. Such treatment removes the throbbing pain, but may leave the dull continuous pain unaltered. The especial indication for this treatment is dull throbbing pain of the head, and when this is situated over the brow or around the eye the medicine may be expected to afford relief.

MANCHESTER ROYAL INFIRMARY

ERGOT.

Ergot has a disagreeable, bitter taste, and occasions an abundant secretion of saliva. In large doses it produces nausea, vomiting, colic, and diarrhœa, with giddiness, headache, and dilatation of the pupil. The pulse is much retarded, and slightly weakened.

After its absorption into the blood it is supposed to cause contraction of the blood-vessels, and especially of the cord. This statement, made by Brown-Sequard, has been noticed in the article treating of strychnia. It has been given to arrest various forms of hæmorrhage, as from the nose and lungs, it is said with success. It has also been applied topically to check bleeding. If taken for some time, it produces in some spasmodic contractions of the muscles, in other persons, gangrene of the extremities, which is generally in character like senile gangrene. Both these consequences of ergot are very fatal.

Its effects are most expressed on the uterus, especially when pregnant. It excites in this organ powerful and continuous con-

tractions. It is thus used in tedious labours, when the uterus is becoming exhausted, but must not be employed till the delivery is nearly completed, and when there is no obstruction to the passage of the child, otherwise it may occasion considerable damage to the delicate structures of the mother. It is supposed by many to endanger the life of the child in two ways, namely, by subjecting it to powerful and continuous pressure from the uterus, and by weakening its heart. It is asserted by some persons the former can be avoided by administering the medicine in small doses, when the natural contractions of the uterus are strengthened, but are not made continuous.

It is extremely useful in post-partem hæmorrhages, and arrests the bleeding, by contracting firmly the uterus. It is also of great use in the different forms of menorrhagia, even when these depends on tumours of the uterus, under which circumstance it is perhaps the most valuable medicine known, checking such bleeding, when other remedies, even bromide of potassium, has failed, and when the patient is almost in a hopeless state. In such critical circumstances, it must be given in full doses, and be repeated every hour or two hours. Its action in menorrhagia is generally very speedy, and the bleeding may be checked or stayed by it in a few hours. Perfect rest, with counter-irritation, as dry cupping over the sacrum, should, in serious cases, be employed at the same time.

It has been used with benefit in some cases of leucorrhœa, and is stated to be useful in neuralgia and paraplegia, whooping-cough, and incontinence of urine.

To produce contractions in the uterus, the infusion is the most appropriate preparation. Two drachms of the freshly-powdered ergot are to be infused for an hour in half a pint of hot water, and the liquid is to be given in tablespoonfuls every five or ten minutes. Or if there be not time for the preparation of this, twenty drops of the liquid extract may be given every hour or two hours, according to the urgency of the case.

TEA AND COFFEE.

These substances are used as common beverages, and are possessed of agreeable tastes.

In the stomach, tea, as a strong infusion, is sometimes used in poisoning by tartar emetic, or the alkaloids, which substances are precipitated by the tannin it contains.

There are few substances which are more to be avoided in flatulent dyspepsia than tea. It is harmful in two ways, for women who suffer from this disagreeable complaint, often drink large quantities of weak tea, when the excess of fluid will promote the distension, and even where but little is taken, tea of itself is found to promote the formation of wind.

With some persons, coffee is slightly purgative.

The active principle of these substances is absorbed, and acts as a stimulant to the nervous system, and are especially useful in this way to remove fatigue; indeed, for such a purpose they are under ordinary circumstances, to be preferred to alcoholic drinks.

Dr. Parkes, in his work on Hygiene, says, "Coffee is a most important article of diet for soldiers, as not only is it invigorating, without producing subsequent collapse, but the hot infusion is almost equally serviceable against both cold and heat; in the one case, the warmth of the infusion, in the other the action of the skin being useful; while in both cases, the nervous stimulation is very desirable. Dr. Hooker tells us, that in the Antartic Expedition the men all preferred coffee to spirits, and this was the case in the Schleswig-Holstein war of 1849. The experience of Algeria and India (where coffee is coming more and more into use) proves its use in hot climates." The same authority, speaking of tea, says, "Tea seems to have a very decidedly stimulative and restorative action on the nervous system, which is perhaps aided by the warmth of the infusion. No depression follows this. The pulse is a little quickened. The amount of pulmonary carbonic acid is, according to E. Smith, increased. The action of the skin is increased, that of the bowels lessened. The kidney excretion is little affected, perhaps the urea is a little lessened, but this is uncertain."

"As an article of diet for soldiers, tea is most useful. The hot infusion, like that of coffee, is potent against both heat and cold, is most useful in great fatigue, especially in hot climates (Ranald Martin), and also has a great purifying effect on water."

For their influence on the nervous system, they, and especially coffee, are used in the headache of nervousness and of exhaustion, and also to arouse and keep awake persons poisoned with opium.

With some persons, either or both of these substances occasion much palpitation of the heart, with great sleeplessness and much mental excitement, and thus they cannot with such be used as beverages.

Coffee, with some persons, increases rather considerably the urinary water, and, it is said, lessens the excretion of urea without any subsequent increased elimination, and has thus been considered to check metamorphosis. Dr. Squarey, of University College, in some careful experiments has shown these conclusions in respect to urea to be wrong.

CINCHONA AND ITS ALKALOIDS.

Powdered bark contains, besides various alkaloids, a considerable quantity of tannin, whose action on the body must be remembered when we administer bark, or any of its preparations.

Finely-powdered bark has been applied, apparently with great benefit, to foul, indolent, sloughing, and even gangrenous ulcers. It is to be dusted thickly over the sore and left to form a kind of poultice. Hospital gangrene has been successfully treated in this way.

As a dusting powder, bark has been employed to check profuse formation of pus, mucus, or the secretion of eczema. In such cases its success probably depends on the tannin it contains, and thus other and cheaper preparations of tannin would be probably as useful and far more economical.

In the mouth, cinchona bark and its preparations have a very bitter taste, and, like all bitter substances, stimulates for a short

time the salivary glands, and so produces an increase of saliva. The tannin of the bark precipitates the mucus of the mouth, and also acts as an astringent to the mucous membrane itself.

Powdered bark has been used as a tooth-powder.

In the stomach, the alkaloids when swallowed in an insoluble form, combine with the acids of the gastric juice and become soluble. It is thus unnecessary, except for convenience, to administer quina and cinchona with an excess of acid.

The alkaloids of bark probably suffer no other change in the stomach than the one just mentioned. Their action in the digestive tract is similar to that of bitters generally. They act as slight irritants to the mucous membrane, and so produce both in the mouth and stomach an increase of mucus. It is also generally stated, that the gastric juice is for a short time, and to a small extent, increased in quantity by cinchona; and further experiments show that cinchona and its alkaloids check the digestion of food by gastric juice, and affect in a similar manner fermentations, as of sugar by yeast. They destroy septic germs. The effects of cinchona, therefore, appear to be the following:—

1. It increases for a short time the production of both saliva and gastric juice, and can, by this means, in a small measure aid digestion.

2. It is an irritant to the mucous membrane, and promotes the secretion of mucus of the mouth and stomach.

3. It checks digestion and fermentation.

As an irritant, bark or its alkaloids can set aside slight diseased changes in the mucous membrane, and in this way prove useful in some forms of dyspepsia, and indirectly increase both appetite and digestion. By checking fermentation, these substances are serviceable when unhealthy or excessive fermentations occur.

From our theoretical knowledge, it would appear that quina cannot aid digestion in any great measure, nor increase appetite when the stomach is healthy, for although by it the gastric juice is to a small extent increased, still the digestive power of this is lessened by the quina, and thus the good which would have occurred from its former action is annulled.

Yet experience scarcely supports these theoretical conclusions, for in many instances where the stomach appears to be healthy, quinine certainly seems to sharpen the appetite and assist the digestion. This effect is particularly observed in the case of inhabitants of large towns, and of elderly people.

Quina is supposed to have no influence over the formation of bile.

Large doses of these alkaloids produce great thirst, burning pain at epigastrium, with nausea and vomiting. Their influence on the intestines is probably similar to that on the stomach. They are given with benefit to persons suffering from worms; as, however, decoction of cinchona appears to be without influence on ascarides and tæniæ, the good which quina accomplishes must be effected by the improvement it makes in the mucous membrane, and by preventing the production of the abundant mucus which appears so favourable to the development and growth of these worms.

When quina is taken in large quantities some of it is said to pass off with the fæces.

The alkaloids of bark find an easy entrance into the blood, and much of the quina which is administered may be re-obtained from the urine. Whether any suffers decomposition in its passage through the body is unknown, and what changes the alkaloids effect in the blood has not been at present ascertained.

The statements of the influence of quina on the pulse are discrepant. It is often said large doses reduce the number of the pulse, while small ones increase them.

Mr. Gill and the author investigated the effect of large doses of quina on the pulse and temperature. Their experiments were conducted on a boy and girl, the former 10, the latter 13 years old. The boy was convalescent from rheumatic fever, the girl was healthy.

With the latter the pulse without quina beat from 60 to 64 in the minute, by quinine the following changes in the frequency were effected:—

Dose.	Rise began.	Reached.
gr. 8	in 35 minutes	94
„ 10	„ 15 „	72
„ 12	„ 95 „	72
„ 20	immediately	120
„ 20	in 50 minutes	96

In the last observation the pulse for about the first 30 minutes fell in frequency. This did not occur with the other observations. We shall mention directly the depression in the temperature we obtained in the experiments. Here it is necessary to state that the pulse was at its fastest when the temperature began to be depressed by the quina. The increase in the frequency continued—

Dose.	Time continued.
gr. 10	170 minutes.
„ 20	195 „
„ 20	Did not subsequently fall much.

On every occasion with the increase in the frequency there was a loss of force. Briquet has shown by the aid of the hæmadynamometer that the lateral pressure of the blood on the arteries is lessened in proportion to the dose of quinine.

The effect on the pulse of the boy on whom Mr. Gill and the author experimented was different. The rheumatism from which he had recovered left a mitral regurgitant murmur of the heart, and very probably also much damage of the heart's substance, for his pulse beat 112 to 120 in the minute.

On one day two doses of 10 grains each were given him; the pulse was not altered in frequency on either occasion; on both, however, the strength was diminished. On another day he took a single dose of 10 grains. For 50 minutes the pulse fell from 108 and 112 to 104 and 96, and at the same time grew in strength. After this it attained a frequency of 120 in the minute, and again fell in force.

On two occasions when the girl's pulse was at its quickest, it became irregular both in force and rhythm.

The influence on the temperature of fever-free persons was likewise investigated. The results of the observations are given in the following table :—

Boy.

Quantity.	Fall in temperature.
gr. 10	None
,, 10	0·2
,, 10	None

Girl.

Quantity.	Fall in temperature.
gr. 8	0·2
,, 10	None
,, 10	None
,, 20	1°
,, 20	0·4

From the latter it appears quina does possess the power to reduce the temperature, but to do so in any appreciable degree large doses, as of 20 grains, must be given, and even then the depression is only slight, and may not amount to half a degree Fahrenheit.

It may be said the fall in the temperature here does not represent the whole effect of the quina, as there would have occurred a rise in the temperature at the time the depression occurred, and hence, if we wish to learn the whole influence of the quina we must add to the amount of depression the rise which should have happened. To this the author is able to answer that he has made many careful observations on this point, and has always found the heat of the body to remain very constant between 9 A.M. and 4 P.M.

The following table gives the time at which, after the quina, the depression occurred :—

Quantity.	Time.	Depression lasted.
gr. 20	in 55 minutes	3 hours 15 minutes.
,,	,, 80 ,,	45 ,,

In this table the occasions on which the fall only reached 0·2 have not been included, as such a slight depression might easily be produced by accidental causes, even when the greatest care is taken.

After large doses many of the senses are affected. Thus there occur great noises, as of bells ringing in the ears, and in some cases the person is made quite deaf. This deafness has been known to remain, and the sense of hearing has been lost for the rest of life. Such an unwished-for occurrence is very rare, for usually in a short time, it may be a few days, the noises cease, and the hearing becomes natural again. By large doses, moreover, the sight is dimmed, and this may amount to almost total temporary blindness, or only to a little mistiness. In the observation shortly before alluded to, such an effect on the sight occurred, but strange to say on some occasions this was limited to one eye, or began first in one before it affected the other. The pupil of the affected eye was very generally dilated. Sometimes by the quina this dilatation of the pupil is extreme. Severe frontal headache is one of the most distressing, as well as constant, attendant on a large dose of quina. This pain is sometimes agonizing, and is generally, dull, heavy, and tensive. While these symptoms are present, and indeed very generally before they appear, the face is flushed, and the eyes suffused, while the expression is dull and stupid.

With some persons, who are susceptible to the action of this medicine, even small doses will produce some of the above symptoms, but especially the headache with confusion of thought.

It is right to state that while the above is certainly correct, yet enormous doses of even many drachms in the day have been taken without the appearance of these symptoms. This has been especially noticed of late, as it has become somewhat customary to treat pyæmia with very considerable doses, often repeated, of this alkaloid, and no doubt in these instances there very often has been present none of the symptoms above detailed; still by many it is considered dangerous to administer the medicine in such quantities, and there is certainly at present no evidence whatever

of the usefulness of quina in this extremely fatal disease. Contrary statements of its usefulness have been made, but without due regard being paid to the natural course pyæmia runs, for the great falls in the temperature, often repeated several times a day—which occur when the disease is altogether untreated—have been by many attributed to the influence of the quinine.

Piorry has shown that quinine diminishes the size of the spleen during a fit of ague, and this it does at once. It is said the drug exerts a similar effect on this organ during other fevers. It has not been shown to possess any influence on the spleen in health.

The influence of cinchona and its alkaloids on the various forms of intermittent fever is well known. It possesses more influence over this formerly common complaint than any known drug. How this is accomplished is at present quite unknown, although by some it has been supposed to check the fever by its influence on the spleen, but granting this, which is by no means established, it remains to show how the influence of the quina on the spleen can prevent the return of the paroxysms of fever.

Some of the peculiarities of the action of quina on intermittent fever may be noticed before the way to administer the medicine is discussed.

It very generally at once arrests the disease, although it is necessary to bear in mind that this remedy may dissociate the symptoms from the elevation of the temperature, or, in other words, the symptoms such as shivering, heat, sweating, quickened pulse, may be entirely removed, while the elevation in the temperature may be as great, or nearly as great, as on previous days. Mere rest will sometimes accomplish the same dissociation. It is necessary to recollect this fact, or otherwise it may be concluded that with the removal of the symptoms the disease is cured, and thus the patient may be permitted to return to his usual avocations when the paroxysms will speedily return, unless unnatural elevation of the temperature has also been restrained.

A still more curious circumstance remains to be stated. It appears that quina may check all the symptoms, and even the

periodical elevation of the temperature, and yet at the time these have happened on previous days there may occur an increase in the urea and urinary water as great as has happened during a severe paroxysm on former days; that is, all the symptoms of the paroxysm are removed except those of the urine.

From one experiment which the author made, it appears probable that if the quina is given after the fit has begun, it has no power to prevent the elevation of temperature of that paroxysm, although it may effectually prevent all others.

As regards the administration of this drug in ague, much difference of opinion has and does still prevail. By some it is held that quina is less powerful over the disease than the powdered bark, even when the cinchonine is allowed for, and it is even held powdered bark is more tonic than quina. On the other hand, there is no doubt powdered bark from its bulk, and on account of the tannin it contains, frequently upsets the stomach.

What quantity of the medicine is required for the removal of the complaint? Some give small doses, and frequently repeat them; others prefer one large administration, to be given between the paroxysms, and this is in most cases sufficient to at once arrest the disease, and so save the patient the annoyance and ill health from a repetition of the fits which may occur after small doses.

The mild forms of the disease, such as are now generally met with in this country, can, without doubt, be very speedily stayed by small doses often repeated.

Much difference of opinion prevails concerning the time to give the medicine. Some say the drug should be given immediately the fit has commenced, but this advice is very generally held to be bad, indeed it has been asserted when thus employed it makes the immediate attack more severe.

Trousseau advised 15 grains to be taken immediately after the fit, and this to be repeated with an interval, first of one, then of two, three, and four days, and so forth. This is probably a good way to ensure a perfect cure. It is important to recollect that the effects of quina on the fit bear no relation to its physio-

logical operation, either in time or degree, as a small dose may prevent the occurrence of a fit twenty-four hours after its administration, while its effects on the system may never have been apparent, or may, long ere this, have passed quite away.

In some cases the quina appears to remain powerless against the disease, and it then not uncommonly happens for the administration of an emetic each morning to bring the complaint at once under the control of this medicine.

The more recent the attack, the sooner and more certainly will the medicine cure the patient.

In the malignant forms of ague quinine is of especial use. In such cases the dose should be a large one, and be given in a non-febrile period. No circumstances, in such severe forms of the disease, are to be considered as contra-indicating its use. If it cannot be borne by the stomach, it may be given by the rectum.

In remittent fever, large doses should be administered during the remission, and be often repeated.

It is used as a preventive of the disease under consideration, and it is a rule in the navy that sailors sent ashore where this fever prevails must take quinine before they land and after they return. By this precaution the disease is greatly prevented.

The other alkaloids besides quina appear to possess the power to check ague, although they are inferior to the last-named alkaloid.

Cinchonine, it is said, must be given in doses one-third larger than quinine.

It is well known that diseases are often modified in their course, and are made intermittent in type, in persons who have previously suffered from ague. To such, quinine may be given with advantage.

Neuralgia again, not uncommonly depends on malarial poison, and is then of a distinctly periodical type. In such complaints quina is highly serviceable in a large dose, given shortly before the attack is expected, as it also often proves in other forms of neuralgia when they at all present this periodical character. Nay, even where this is quite absent, large doses of this medicine not uncommonly succeed in removing the pain of this distressing malady.

It is considered by many that quina affects the fever of other complaints besides ague, and it has been recommended in full doses for this purpose in typhoid fever, bronchitis, broncho-pneumonia of children, and also, as is elsewhere mentioned, in rheumatism.

This subject is at present occupying much attention, but, as far as the author knows, no single well-observed case, corroborative of these statements, has been yet published.

It is said to be useful in paroxysmal asthma, and also laryngismus stridulus.

In acute rheumatism, cinchona or its alkaloid have been recommended in large doses of 10 to 30 grains, repeated several times a day. Some recommend its use at the commencement, others at the termination of the complaint. Those who adopt the last method believe by its use the great anæmia which so generally accompanies acute rheumatism is prevented, and it is also maintained that by quina the complaint is shortened, and relapses made less frequent.

Other authorities are altogether adverse to the use of this drug in this disease, maintaining that relapses are made more frequent by it, and that the drug merely disguises the pain, but in no way shortens the attack. The truth of one or other of these assertions yet remains to be proved.

Quina is often given, and, in many cases, with decided advantage, to check the profuse sweating of exhausting chronic diseases, such as chronic phthisis. If a small dose does not succeed in checking this excretion, a large one of six or eight grains administered at once, or in divided doses, repeated hourly, will generally succeed.

Quinine is further often employed with much benefit in diseases of malnutrition. It is often useful in impetigo and ecthyma, when these complaints are connected with bad nutrition. It is also of great benefit to the pale and badly fed of large populous towns. Whether its good effects in such cases are dependent on its action on the stomach, or on the tissues after its absorption into the blood, is at present uncertain.

Quinine has further been recommended in passive bleeding,

and in great suppuration, in profuse menstruation, in spermatorrhœa, and in profuse secretion of milk.

After its employment quina can be found in the blood, which dissolves more than water, also in the saliva, bronchial mucus, milk, and dropsical effusions. It is said to be eliminated slightly with the sweat. Briquet, however, after large doses could detect none in this excretion.

Both quina and cinchona in part pass off by the urine, but a part of them appears to be either consumed in the blood or to be eliminated in some other way. It is considered by Kerner that, "a respiratory power of 3,000 c.c. can destroy 15 grains of sulphate of quina in 24 hours; any amount over this will pass into the urine." In healthy persons quinine appears in the urine in the course of two to five hours, but more quickly in young than in old persons. In some diseases (intermittents, pulmonary, emphysema, pneumonia, morbus Brightei) its exit is much delayed, and in three cases in which large doses were given, it could be detected in the urine by Dietl for many weeks after the last dose. This would certainly indicate that it is not easily destroyed in the body.

Dr. Ranke has made the important observation, that 20 grains of disulphate of quinine lessen very greatly (one-half) the excretion (formation ?) of uric acid. The effect continued for about two days after a single large dose. The other constituents of the urine were unaffected. It would seem likely that the uric acid is not simply retained in the system; for as there was in Ranke's cases no subsequent increased excretion after the effect of the quinine had gone off, its formation was absolutely lessened, or it must have been converted into some other substance.—(Parkes on Urine).

Quinine appears to be useful in some cases of intermittent hæmaturia, but to be quite useless in others.

Certain circumstances appear to modify the operation of the salts of quina. In young people the physiological symptoms appear early, but such persons resist the toxical action of the drug. Old people, on the other hand, are often much influenced by it. The action of the

alkaloid is said by some to be counteracted by diffusible stimulants, such as wine and coffee.

It has been asserted that quina when given in health can produce fever.

CALUMBA.

Calumba is used as a tonic to increase both appetite and digestion. It has a slight irritant action on the stomach, as indeed most bitter substances have, and is considered by this property to be able to set aside slight changes in the mucous coat of the stomach, and, in this indirect way, to assist appetite and digestion. It is easily tolerated by the stomach, and is thus employed when this organ is in a weak state, as during the convalescence from an acute disease, when it is often found that calumba is borne with benefit, while stronger tonics may upset the stomach.

GENTIAN.

Gentian is used for the same purposes as calumba. It is reputed by some to have, in addition, a slight purgative action.

Mixed with infusion of senna, it is useful when a tonic and purgative medicine is required.

QUASSIA.

Quassia is poisonous to some of the lower animals, as flies and other insects.

It is used as a tonic like the preceding substances. It has been used in intermittent fever.

It is very useful as an injection for ascarides, which it destroys, and very likely also accomplishes their destruction when it is swallowed.

CHAMOMILE.

These flowers contain both a volatile oil and a bitter substance, and thus to some extent they combine the properties of the preceding medicines with those of the etherial oils.

They are not often used as tonics, but an infusion is sometimes employed to assist emetic medicines to produce vomiting.

The infusion, in doses of half a drachm or a drachm, may be very usefully given, every hour or two hours, to children with a diarrhœa of green, many-coloured, and slimy stools. Such a diarrhœa is frequent in summer, and also during teething. It generally speedily yields to this medicine. Other kinds of summer diarrhœa may also be efficiently treated by this medicine.

It has been used in intermittent fever, in neuralgia of the fifth nerve, and to prevent the returns of "sick headache."

CHIRETTA.

Chiretta, like the preceding medicines, is a tonic, and, like them, when used to increase the appetite, it must be taken a short time before food as the effects of bitters soon wear off.

CASCARILLA.

Cascarilla has a warm, agreeable, bitter taste, and is a stimulant as well as tonic. It may be used as the preceding medicines to promote appetite.

It has been used in intermittent fever, in dysentery, and dyspepsia.

ORANGE-PEEL.

Orange-peel contains both a bitter principle and much volatile-oil. It thus combines the properties of bitter substances with those of the etherial oils.

ELATERIUM.

In the mouth this drug has a very bitter taste, and excites a free secretion of saliva.

In the stomach and intestines it occasions diarrhœa of very watery stools. It is a powerful drastic hydrogogue cathartic. It also often produces colic, and, not unfrequently, vomiting. In large doses it may produce inflammation of the stomach and intestines, and even of the peritoneum. It is as a purgative, and especially in dropsies that elaterium is used, when it is hoped by carrying off a large quantity of water, the dropsy may be reduced. It is thus used in ascites, and also in the dropsy from kidney or heart disease. It must be borne in mind that free purging is very exhausting, and that elaterium very often disorders the stomach and spoils the appetite. It is a medicine which must be given with caution.

COLOCYNTH.

This drug, like the last, has an intensely bitter taste, and, like it, also occasions an abundant secretion of saliva.

When swallowed it produces diarrhœa, colic, and sometimes vomiting. In large doses it may excite gastro-enteritis and peritonitis. The diarrhœa is watery, and, after large doses, serous, mucous, and bloody.

It is chiefly used as a purgative, but it is almost always combined with other substances of a similar action. In obstinate constipation it is a good custom to employ a few drops of the Prussian tincture several times a day. The frequency and the number of drops must be proportioned to the obstinacy of the constipation: usually two or three drops on a piece of sugar, given three or four times a day, will give a comfortable relief from the bowels.

It has been used as a drastic cathartic in dropsies, and, like most other powerful purgatives, it has been used for worms, but

like them, merely mechanically expels them, but has no direct poisonous influence on them. Purgatives are not, therefore, good anthelmintics.

ALOES.

Aloes has been used as a slight stimulant to wounds, and when thus employed it often purges. "Dr. Gerhard, of Philadelphia, found it the medicine best adapted for endermic uses, as its application does not irritate a blistered surface very powerfully. Ten grains of it thus employed produce five or six stools, which were generally accompanied with griping. Infants are purged by the milk of nurses who have taken aloes." (Stellé.)

It is reputed to be a tonic to the stomach, and also to increase the secretion of bile.

It is chiefly employed as a purgative, and acts mainly on the large intestine and rectum. Its action is slow, and six, twelve, or even twenty-four hours may elapse before it operates. The motions it causes are a little softened, but not watery. It evidently acts but little on the mucous membrane of the intestines, and is merely an evacuant of fæces. It often occasions slight griping, and sometimes tenesmus. As its action is tardy, it is useless to combine it with more speedy purgatives, and it must either be given alone, or some six or eight hours before other purgatives. From what has been said, it is apparent aloes is unsuited when a speedy evacuation from the bowels is required. It is said not to become less powerful by habit, but, on the contrary, the quantity may be gradually decreased—a property which evidently fits it for cases of habitual constipation. Its action is considered to be heightened by combining it with sulphate of iron.

Aloes, as also senna, may be usefully mixed with some bitter tonic, as gentian, when both a tonic and purgative is required; and when combined with tonics, it is said purgatives act in smaller quantities. The following dinner pill is useful both as a tonic and slight purgative; it must be taken shortly before

dinner:—Aloes, 6 parts; Ext. of Cinchona, 3 parts; Canella, 1 part; Syrup of wormwood, a sufficiency. Divide in 4-grain pills. One or two to be taken at a dose.

It is in habitual constipation that aloes is most frequently employed, and in such circumstances is perhaps the best purgative known. It has been accused of producing piles, and no doubt can, in full doses, aggravate this disease when it is present; but most authorities who have watched the action of this medicine are inclined to attribute the piles to the constipation the aloes is employed to remove, and not to the aloes itself.

From what has just preceded, it will be seen this medicine must not be employed as a purgative by patients with piles. It is sometimes used to destroy ascarides.

By its action on the rectum it sympathetically affects the neighbouring pelvic organs, as the uterus, and is thus useful in many cases of amenorrhœa and deficient menstruation. It must be given at, and just before the menstrual period. Dr. Graves, speaking of amenorrhœa and its treatment, says, "The periodicity of this function can still be traced, even in cases where suppression has continued for a great length of time, by means of the menstrual molimina (pains in the loins, thighs, and hypogastric region, flushings, colicky pains of the abdomen, general feeling of malaise), which occur at stated intervals; in endeavouring to bring on the discharge therefore, we must be guided as to the time the attempt should be made, by an observance of the period at which these molimina occur, for a few days before that time our efforts to produce a determination of blood to the uterus may be judiciously employed, and if they fail, the attempt should be abandoned until a few days before the next menstrual period; of course, I speak not here of the general constitutional treatment, for this must be constantly persevered in, one of the chief means of bringing back this evacuation being the restoration of health to the natural standard. In some this is to be effected by a tonic, and in others by an opposite mode of treatment.

"But of this it is quite unnecessary to speak, as I suppose you are all acquainted with the essential difference between the general modes of management required, according to the consti-

tution and habits of the patient. What I wish to impress on your minds is, that all those remedies, as pediluvia, stuping of the genitals, leeches to the inside of the thighs, near the labia, aloes, and other stimulating purgatives, &c., should be only used at the times already spoken of. To use them at any other period, either after the molimina have disappeared, or during the intervals between them tends, in most cases, still further to derange nature, by determining to the uterus, at an unseasonable time, when there is no natural tendency to that organ. Under such circumstances, the very same means will frequently fail, and prove injurious, which, applied so as to coincide with the time of the natural effort, would have been successful.

"To illustrate these principles by an example; we are consulted in the case of a young woman affected with various hysterical symptoms for several months, and during that period more than usually subject to headache, languor, loss of spirits, diminution of appetite, and irregularity, and usually constipation of bowels; she is pale, and complains of various pains, and uneasy sensations, and has not menstruated since the accession of these symptoms. Here it is evident that the constitutional treatment must be strengthening and tonic. The practitioner will, therefore, recommend regular hours, much gestation in the open air, a nutritious diet, tepid, and afterwards cold shower-baths; he will regulate the bowels, and afterwards prescribe a course of tonic medicines, chalybeates, preparations of bark, strychnia, &c; he will likewise inquire carefully when the last period happened, and when, and how often since that occurrence menstrual molimina were observed.

"He thus ascertains when they should again recur, and contents himself with enforcing the constitutional treatment until about six days before the calculated time. Then he lays aside the other medicines, and has recourse to those means which determine to the uterus. Two leeches are applied to the inside of the thigh, near the labium, every second night, until they have been three times applied. The bleeding is encouraged by sleeping. On the intermediate days the bowels must be actively moved by aloetic pills, and for three nights before and after the

molimina, hot pediluvia, rendered stimulating by mustard seed, may be used. During the same time also frictions, with stimulating liniments, should be applied to the feet and legs every morning, and oil of turpentine, or tincture of cantharides, may be exhibited internally, while the necessity of more active exercise is inculcated. The intention of the leeching is to produce a tendency of blood to the part, which tendency is increased by each repetition of the application, and it is still further augmented by these applications being made only about the time that the menstrual discharge should have taken place. *If these means fail, they must for the moment be laid aside, and the constitutional treatment must be again resumed until the same number of days before the next period, when the list of remedies above spoken of must be again tried,* and in few cases indeed shall we find them to fail."—(Graves' Clinical Lectures.)

SQUILL.

Squill has a bitter taste. It has a powerful action on the stomach and intestines, exciting, in full doses, great nausea and vomiting, with frequent watery and even bloody diarrhœa. These symptoms are produced when a preparation of the drug is injected into the cellular tissue or peritoneal cavity.

It is never used as an emetic or purgative, but is almost exclusively used as an expectorant in bronchitis.

It is highly praised by some as a diuretic. It is recommended in all forms of dropsy.

JALAP.
SCAMMONY.

Buchheim, in his work, asserts that these two substances are made active as purgatives by the addition of the bile, and if this be excluded, they are without effect. They are easily soluble in the bile, and probably undergo decomposition. He further says

the products of decomposition are unknown. Taurin and glycocoll have no influence on their efficacy, but tauro-cholate and glyco-cholate of soda have, and Buchheim thus concludes that the activity of these substances is determined by the soda of the bile. From the decomposition they undergo they excite diarrhœa of watery motions, with some colic and occasional vomiting. Their use is often followed by much constipation.

These medicines are used as purgatives in obstinate constipation, and jalap, in combination with other substances, is employed in dropsies. Scammony is frequently used, and with much advantage, to destroy the small thread worms which infest the rectum.

MANCHES
ROYAL
INFIRMA

RHUBARB.

Rhubarb is used as a purgative, but is asserted to be also a tonic to the stomach. After it has purged it constipates the bowels, on which account it is often used in diarrhœa in its early stages to expel any irritating matters which may be present in the intestines, and after their expulsion to check the diarrhœa. It is a very useful purgative to children, especially when mixed with one-third its weight of bicarbonate of soda.

Dr. Stillé, in his work, says, "Dr. S. Jackson, formerly of Northumberland (U. S.), speaks of it as a remedy of surprising efficacy in piles when laxatives are needed. He directs a piece about ten grains in weight to be chewed, or rather slowly dissolved in the mouth every night, or less frequently according to the degree of constipation present. He estimates its power when thus employed as equal to that of five times the quantity in powder. He also recommends it as a convenient and certain means of combating the costiveness incident to pregnancy, and the hæmorrhoidal swellings which are incident to this state. We can add our testimony in favour of this method, which has a great advantage over the use of occasional laxatives." (Stillé: Therapeutics.)

After the employment of rhubarb the urine is generally

coloured reddish-yellow, which, on the addition of ammonia and other alkalies, is changed into a purple red. It also colours the sweat, the serum of the blood, and the milk, and makes the last bitter and purgative.

It may be usefully mixed with some tonic.

SENNA.

Senna is an active purgative, and increases both secretion from the mucous membrane, and peristaltic action of the muscular coat of the intestines. It often produces both nausea and griping. It may be usefully combined with a bitter tonic, as in the mistura gentianæ composita of the former pharmacopœias. This contains an ounce of compound infusion of gentian to half an ounce of compound infusion of senna. This compound is very useful in dyspepsia with constipation.

Senna renders the milk of a nursing woman purgative, and may produce colic in the child.

SENEGA.

Senega increases the secretion of the bronchial mucous membrane, and probably of the other mucous membranes also; it produces a burning itching feeling in the mouth and throat.

It is used in chronic bronchitis, especially of the old, in whom the disease is combined with emphysema. It is used by some in croup and whooping-cough. It is also reputed to be diuretic, and is used when the deficiency of urine is owing to disease of the kidneys. "Infusion of senega (4 to 6 drachms infused in 6 to 12 ounces of water, and taken during the day) produced no effect on the urine in Böcker's experiments, conducted on himself and on a pregnant woman."—(Parkes on Urine.)

BENZOIN.
BENZOIC ACID.

Either of these substances is very useful in certain forms of itching. The solution for this purpose may be prepared from the compound tincture of benzoin, by the addition to it of an equal quantity of water. By this addition the resins of this compound are precipitated, and hence they cannot take any part in removing the itching. As benzoic acid dissolved in water possesses this property, it is probable, in part at least, that this is the active agent against itching in the compound tincture of benzoin. The solution of benzoic acid should contain ten to twenty grains of benzoic acid to the half pint of water. Such mixtures will be found of extreme use in chronic urticaria, the itching of which disease they remove for hours at a time. This power to allay the itching is possessed by the benzoic acid, even when the urticaria is not produced by lice. The same solutions are very useful by allaying the itching of scabies and that produced by the body louse, but both of these diseases are better treated by other remedies, the first by sulphur ointment, the second by Stavesacre ointment. The solution of benzoic acid appears able also to destroy the body louse, and thus may actually cure the patient of the itching produced by these animals.

Sometimes after liniment of iodine is painted over the body there arises a crop of itching pimples in and around the skin painted by the iodine. These may continue to annoy the patient for a good many days. Their itching may be at once removed by the benzoic acid solution, or a solution of carbonate or cyanide of potash in water (ʒj to oj). These last-named lotions are also useful in removing the itchings of urticaria, but are inferior to the benzoic acid solution.

Benzoic acid is said also to be "expectorant, diaphoretic, and diuretic."

Anthelmintic Medicines—

FILIX MAS.	**TURPENTINE.**
KOUSSO.	**ARECA NUT.**
KAMELA.	**POMEGRANATE ROOT.**
SANTONIN.	**POWDERED TIN.**

MUCUNA, &c.

The intestines may be infested by worms of different kinds. The common kinds, and those which are treated by the above medicines are the flat worms (Tenia solium and Bothrocephalus latus), round worms (Ascaris lumbricoides), and thread worms (Ascaris vermicularis). These may be treated in three ways. Medicines may be employed which shall kill the worm by their mechanical action on it, as powdered tin and mucuna, or those may be used which, as powerful purgatives, by increasing the peristaltic action of the intestines, expel the worm. Such medicines are jalaps, scammony, &c. These remedies are never used, as the last class, now to be named, are to be greatly preferred, namely those remedies which poison and kill the worm, while at the same time they have very little effect on the tissues of the human body. Such medicines are those composing this group, with the exception of powdered tin and mucuna. It must, however, be borne in mind all are not equally efficacious for every kind of worm, but that some are poisonous to one kind and are harmless to others. It must be further recollected that the success of each of these preparations will depend on the method of their application. The same general directions will apply to all. It is desired that these medicines should reach the worms in as concentrated a state as possible, but if the stomach and intestines are filled with food they must be very considerably diluted, and it may be to such an extent as to prevent their having any poisonous effects on the worms. It is desirable, therefore, to give over night a purgative to clear out the bowels, and also to direct the patient to take a very light tea and no supper. On the following morning, after the purgative has acted, the anthelmintic medicine may be given.

Filix Mas.—This medicine may be given in the following

way:—The patient must take a very light tea, and no supper, and, just before retiring to bed, a dose of castor oil. This purgative is to be preferred to others, on account of its speedy action. On the following morning, at about six or seven o'clock, by which time the oil will generally have acted, the liquid extract of male fern, in a dose varying according to the age of the patient, from twenty grains to two drachms, is to be taken. The patient is then to abstain from food till the bowels have been freely relieved, when in most cases the worm will be expelled. By many persons it is recommended to follow the anthelmintic by a brisk purge, but this will rarely be found necessary, as the simple plan above detailed will very rarely fail to bring away the worm. If too large a dose of the male fern be used, it may cause nausea, sickness, and even colic, but such is not often witnessed if only a moderate quantity is employed. The liquid extract of male fern is slightly purgative, and this is the reason why it is not generally required to administer a purgative after it. The worm should be carefully examined, in order to ascertain if the head has been expelled, for then there is no fear of its growing again. It has, however, been ascertained if only the head and a small piece of the neck be left the worm will die, and hence it must not be concluded if the head cannot be discovered that the patient is not permanently freed of the worm. If any piece is found which tapers to a fine point, and even if the head is not attached, it may be reasonably hoped the worm is destroyed. A good plan to obtain for examination all the worm which has been expelled, is to shake up the motions (which are, by the purgative, already watery and loose) with some water, and to filter the whole through a coarse piece of muslin. By this means, even if the head be separated from the trunk and come away by itself, it will be seen and may be examined.

The treatment for the flat worm by male fern is generally considered the best.

Kousso is also used for tape-worms of all kinds, and appears to be very successful, although not much used in this country. It is the common remedy in Abyssinia, where the tape-worm is extremely common, and has been used there upwards of two

centuries. It must be given in half an ounce dose of the flowers suspended in water, and the patient must have fasted for a short time, as in the previous case. It may cause slight nausea and even vomiting. Its action on the bowels is very slight, and hence it is customary to follow it by a mild purgative.

Punica Granatum.—The bark of this root is used. It is employed (chiefly in India) for tape-worm. Neligan gives the following directions concerning it :—

Two ounces of bruised bark, of fresh root if possible, is to be macerated for 24 hours in two pints of water, and is then to be boiled down to one-half, and to be strained and divided into three doses, which are to be taken with an interval of half an hour between each. Vomiting often occurs, but this should not prevent the medicine being continued till the three doses are taken. This treatment should be occasionally repeated for four or five days. Most practitioners find the dried root inert.

Santonine is the active principle of worm seed. This remedy is very useful for the round and for thread worms, but has little if any power over tape-worms. They may both be treated in the same way. The following method will be found a successful one: Two or four grains, according to the age of the person, must be mixed with a drachm or more of castor-oil, and this is to be taken early in the morning before breakfast. It should be repeated on two or three mornings. This treatment will seldom fail to bring away any round or thread worms, if they be present in the intestines. It has been used, mixed with castor-oil, as an injection into the rectum for thread worms, and Kuchenmeister has found that a solution of santonine in castor-oil, mixed with albumen, killed ascarides in ten minutes, while without the oil the santonine was without effect. He, therefore, recommends it to be given in two- to five-grain doses in an ounce of castor-oil. This quantity is of course intended for adults. Or one or two grains may be suspended in a drachm of syrup, and this may be taken twice or three times a day, if it is found necessary; but, if repeated so often as this, the medicine is very apt to occasion sickness and vomiting, and also a great difficulty in holding the water, and thus it is not uncommon for children, if they take

much of this medicine, to wet the bed at night, and to be obliged to pass water very frequently, or even to be unable to hold it during the day. Lozenges of the following kind may be used :— Brown santonine, ʒiij. Powdered sugar, ʒxiij. Powdered gum, ʒiss. Essential oil of lemons, mxxv. Mix and divide that each lozenge shall weigh 15 grains when dry, when each will contain $\frac{1}{3}$ gr. of santonine. Of these one may be given to a child twice or three times a day.

After santonine, all objects sometimes appear to the person who has taken it, of a green or yellow colour. The urine is coloured orange, and, on the addition of some solution of ammonia is changed to a brilliant scarlet. This remedy is sometimes able to stay the nocturnal incontinence of urine of children, and will be found occasionally to succeed when other remedies, even belladonna, have failed.

Kamela is much used in India for the tape-worm. It may be given in doses of 60 to 120 grains in honey, syrup, or glycerine. It purges briskly.

Areca-nut is much used by veterinarians to remove tape-worms from dogs, but may also be used for the same purpose in the human subject. A whole or half a nut is to be powdered and mixed with some syrup, and to be swallowed. It sometimes succeeds when other remedies have failed.

Turpentine is praised by Neligan for its power over the tape and the round worm, but is more powerful against the former than the latter. It is also efficacious as an injection against thread-worms. Kuchenmeister showed it could destroy the tape-worm in an hour. For a child, a drachm to two drachms must be given.

The thread-worms, which are only found in the rectum, are, of all medicines given by the mouth, as we have said, best removed by santonine. Scammony will also be found effectual against them. They can very generally be speedily destroyed by injections which may be composed of a variety of substances. Thus a teaspoonful of common salt, or a drachm of sesquichloride of iron in a pint of water, will be found very effectual. Lime-water, solutions of alum, and, in fact, any substance which will coagulate the albumen of their bodies will succeed in destroying them.

In the treatment of worms it must always be remembered that the mucous membrane is generally in an unhealthy state, and secretes much tenacious mucus, which forms a favourable nidus for the development of worms, and that without such a state of the digestive canal, worms will rarely develop. The above treatments are, therefore, merely remedial, and after the removal of the worms, medicines which shall correct the condition of the intestinal mucous membrane must be given. This condition of the intestines is generally seen in unhealthy, anæmic children, who may have their health and a sound state of the gastro-intestinal canal restored to them by cod-liver oil and iron preparations. Oils, as it is well known, are also reputed to destroy worms. If these remedies should fail or not be required, those medicines which will remove the catarrhal state from the mucous membrane must be employed. These are common salt, chloride of ammonium, and antimony salts. The general health may also be greatly improved by cold-sponging and out-door exercise, and a judicious diet.

ON POULTICES AND HOT FOMENTATIONS, THEIR USES AND METHOD OF EMPLOYMENT.

These applications are used for their warmth and moisture, on account of which properties they find a very wide employment in disease.

They are applied to the skin when this or the structures beneath it are inflamed. By their warmth and moisture they relax the tissues, and so remove, in some degree, the tension due to the inflammation, and by this means ease pain; but if applied to inflamed tissues, as to abscesses, inflamed pimples, and the like, at the very beginning of their development, the inflammation may, in many cases, be summarily checked, and the formation of pus prevented. Fomentations with water as hot as can be borne are also very successful in arresting inflammation and checking the formation of matter, and should be very frequently employed as adjuncts to the poultices. Acne indurata and similar

inflamed pimples which appear on the face can, by hot fomentations, be often dispersed or much restricted in size.

These applications are of further use when suppuration has been accomplished, and when there is matter to be removed. Then, by softening the tissues, they greatly facilitate the passage of the matter to the surface and its expulsion from the tissues, while at the same time they considerably limit the spread of the inflammation in all directions. Here again, water fomentations very hot often repeated, and for some time continued, may be a very useful addition to poultices.

When employed for the above purposes it is necessary to remember the heat of the application plays a very important part in its action. Poultices should, therefore, be always applied as hot as can be borne, and must be frequently changed or soon they become cool. Indeed they can scarcely be changed too often, but in hospital practice it is impossible to do this very frequently, yet even in such institutions, where the supply of nurses is necessarily limited, these applications should be changed every two or at most three hours.

When applied for the above purposes, that is to disperse inflammation or to hasten the maturation of abscesses, the poultice should be large, and reach beyond the limit of the inflamed tissues, but as soon as the abscess or boil has maturated and has burst, the poultice should be very little larger than the opening in the skin through which the matter is escaping. If a large poultice be continued too long to the skin, it soddens and irritates it, and is very liable to produce an eruption of eczema, or to develop fresh boils around the one first formed.

When an abscess has fully developed and is ready to be opened, it is far better to treat it by Lister's carbolic acid method than by poultices.

When, in skin diseases as eczema, &c., the skin is highly inflamed and is painful, red, and swollen, these conditions may be much moderated, and the pain much subdued by poultices.

The kind of poultice which should be used in such cases will be shortly mentioned.

But not only are poultices soothing to inflamed tissues, when

directly applied to them, but they appear to be so to deep seated parts when placed on the skin over the inflamed or painful organ. They thus prove of very great service in pneumonia, pleurisy, bronchitis, pericarditis, peritonitis, &c. They should then be of large size, and cover a considerable extent of skin. Here again, they act in virtue of their warmth and moisture, and should always be applied very hot, and be removed as soon as they become cool. To avoid exposure of the warm, moist skin, the old poultice should not be removed till the new one is ready to replace it.

These applications for the purposes just mentioned, are extremely useful to children, who, when they are attacked with bronchitis, or broncho-pneumonia, or lobular pneumonia, should have their entire chest enveloped in one of these soothing applications. As young children are apt to be restless, and to toss about in the bed, the poultice soon becomes rucked up and is converted into a narrow band encircling only a very limited portion of the chest, while much of the moist bread or meal of which the application is made, is exposed and becomes cold, as is also the case with that part of the chest which was previously covered by the poultice. To avoid this, what is termed a jacket-poultice should be employed. This is constructed in the following way:— A piece of linen, sufficiently large to "go quite round" the chest should be chosen, and to this tapes should be sewn, in such a manner and in such places, that they can be tied in front of the chest and over each shoulder. It is as well to have the tapes sufficiently numerous to permit of three fastenings down the front of the chest.

That the poultice may retain its heat, one of two plans may be adopted. Either the application should be made an inch or more thick, or, which is better, it may be made thinner, but, after it is applied, the whole chest is to be enveloped in a layer of cotton wool. This last plan has the very great advantage of lightness, and does not hamper in any degree the breathing—a matter of importance in many instances, and is generally so in children.

When employed in inflammation of other deep-seated organs, besides those situated in the chest, the same methods, modified to suit the part, should be adopted. In peritonitis it is of great

importance the poultice should be light, otherwise the pain is aggravated. When employed in such a complaint, the poultices should be thin and covered over with a layer of cotton wool, as above described. If some counter irritation is desired, a small amount of mustard can be conveniently added to the poultice.

When employed in the above-mentioned diseases, that is, for their soothing effects on inflamed internal organs, the poultice should be large.

These applications are of still wider service, and prove useful in acute rheumatism, lumbago, sciatica, pleurodynia, myalgia, and in those so-called rheumatic pains which often attack limited parts of the body, as one arm, &c. To the inflamed joints in rheumatic fever they are soothing and pleasant, although cotton wool is generally sufficient for this purpose. In acute lumbago, no method of treatment is so sure and speedy in bringing relief and a termination to the disease as poulticing. By the employment of these the severest cases are greatly benefited in a few hours, and generally cured in one, or certainly in two days. They so rarely fail to accomplish what has just been mentioned, that the medical man may speak confidently of the relief which they will speedily bring. When used in this disease, they must be large, thick, and very hot—large enough to cover the whole loins or part affected with the lumbago—thick enough to remain quite hot for half an hour, when the poultice must be changed and a fresh one applied. This treatment should be continued for three hours, or longer, if relief has not been obtained; and when it is discontinued the skin must be wiped perfectly dry and be covered with a piece of flannel, and this be again covered by oil silk. This last application promotes, as did the poultices previously, free secretion from the skin, upon which result much of the good obtained appears to depend.

Sciatica may be—although much less successfully—treated in the same way. Both it and lumbago sometimes yield with remarkable quickness to the ether spray. This application appears of most service where there is present one or more tender and especially painful spots, over which the ether should be played till the part is frozen.

Galvanism also proves highly useful in some forms of these complaints, especially in sciatica. If the affected nerve be pretty strongly galvanized, at least great temporary relief may be obtained, and in some cases one or two applications of it, may make this relief permanent. The sciatica and deep seated pains about the shafts of the long bones, which not unfrequently remain after an attack of acute rheumatism, may very often be removed by the employment of galvanism, nay, even the dull aching pain in the joints, which continues in rheumatism after the acute stage is passed, may yield to this treatment.

Poultices employed as for lumbago, and followed by the application of lint and oil-skin, are often useful in severe forms of pleurodynia and myalgia. Usually belladonna liniment is sufficient, and even preferable, and sometimes the ether spray at once and permanently removes the pain of this annoying malady.

As we have said poultices may be constructed of various materials. Those used for the purposes we have just described may be made either of linseed-meal, or oatmeal, or bread, or starch. Each has its peculiar characters, and differs somewhat from the others. Linseed-meal and oatmeal poultices have most properties in common; they make compact but only slightly porous poultices, which retain longer than other kinds both their heat and moisture, and are consequently often to be preferred to bread or starch. But linseed contains a not inconsiderable quantity of acrid matter which irritates the skin, especially if this be of a fine and delicate texture, or when it is inflamed with some eruption. In such cases it not uncommonly happens the linseed poultice cannot be employed without much irritation of the skin, or increase of the inflammation of the eruption, and then oatmeal or bread must be substituted. Bread poultices are more porous and blander than those made of linseed-meal, but the porosity depends very greatly on the plan adopted in making them. Bread poultices, it has been mentioned, retain their heat and give less moisture to the skin than those manufactured of linseed-meal. Starch poultices are not of very wide application, as they give up scarcely any of their moisture to the skin. They

retain their heat for a considerable time, and are very bland unirritating applications.

Before concluding these remarks on the properties of poultices of different materials, it is as well to mention that those composed of linseed-meal are more tenacious than those of bread, and so are less liable to break and to fall about the bed and clothes of the patient, rendering him unclean and uncomfortable.

It is next proposed to say a few words on the way to make a poultice. First it should be seen that all the materials, such as boiling water, linseed-meal, linen, strapping, bandages or tapes, wool and oil-silk, are cut fit for use, and are close at hand. All should be placed before a good fire to warm them thoroughly. These preparatory measures having been adopted, a linseed poultice should be thus manufactured :—Sufficient boiling water is to be poured into the heated bowl, and into this the meal must be quickly sprinkled with one hand, while the mixture is constantly stirred with a knife or spatula with the other, till sufficient meal has been added to make a thin and smooth dough. All this should be accomplished as rapidly as possible, or otherwise the poultice when it is completed will be almost cold. Only an experienced hand can accomplish this perfectly. By adding the meal to the water with constant stirring, instead of the water to the meal, there is insured thorough mixture of the two ingredients, and the meal does not collect into little lumps or knots. After a proper consistence has been acquired, the dough must be quickly and evenly spread on the warm linen, already cut of proper size and shape. This accomplished, the edges of the linen are to be turned over the meal to prevent by pressure any of this escaping beyond the limits of the linen, and so soiling the clothes of the patient. All this accomplished the poultice is to be applied.

Bread poultices may be made in one of the following ways :— Bread is to be cut in thickish slices, and these are to be put into a basin, and over them poured some boiling water, and the whole is to be placed by the fire for five minutes, when the water should be poured off and replaced by fresh boiling water, and this is again to be repeated, after which the excess of water is got rid of by pouring it off and pressing the bread. This is then beat up with a fork

and made into a poultice. Or the following plan can be adopted: Thickly slice stale bread, and pour over it boiling water enough to cover it. Place the whole by the fire and allow it to simmer for a short time; then pour off the excess of water and prepare the poultice. The former plan makes a porous poultice, the latter, one having more the characters of those made of linseed meal. Each as we shall see have their application in disease.

Starch poultices are seldom used, as they yield very little moisture to the tissues, and thus one of the great purposes for which these applications are employed is lost. On the other hand, starch poultices retain their heat for a very considerable time, and are of an entirely unirritating nature. They are to be made in the following manner:—First, a little cold water is added to the starch, and the two together made into a pap. When this is accomplished, sufficient boiling water is to be added to make a poultice of the required consistence, which is then to be spread on linen in the manner already described. Made of this material, these poultices are sometimes used as soothing applications to skin eruptions, when there is much inflammation, with heat and pain.

Bread poultices are, on the whole, to be greatly preferred.

Other kinds of poultices are in frequent use on account of properties in addition to those belonging to the applications just described. Thus there remains for us to describe charcoal, yeast, and carrot poultices.

There are several ways of employing charcoal as a poultice.

The charcoal is used to prevent disagreeable smells from foul sores, and is thought also to provoke in the tissues a healthier state. When employed for this double purpose, the charcoal must be mixed with the substances of which the poultice is made. Bread is best used for this purpose, as it makes a more porous poultice than linseed meal. Some of the charcoal should be uniformly mixed with the bread, but the greater part should be sprinkled over the surface of the poultice just before its application. Whether such poultices are greatly superior to those made of simple bread is perhaps doubtful, for the charcoal must speedily lose its power to absorb gases, and thus to act as a

deodoriser. It may perhaps promote a healthier condition in the sore.

If it is desired to use the charcoal merely to prevent disagreeable smells, and to keep the air of the room pure and sweet, the following plan is greatly preferable to the one just described:—An ordinary poultice is first applied to the sore, and over and beyond this is laid a flat bag made of coarse muslin, and filled with granulated charcoal. Thus employed, this substance effectually prevents smells. After a time it loses its virtues, but these the charcoal again acquires, if it be heated for a short time to a dull red heat.

With foul, sloughing, putrid sores it is a good practice to sprinkle thickly over the wound dry charcoal, and then over the whole to apply a simple poultice. This treatment appears to hasten the separation of sloughs, and to effect a healthier state in the tissues. Charcoal in this manner may be applied to boils when the core is separating, or to bed-sore while the black slough still adheres to the living tissues.

Yeast poultices are thought by some to be very useful applications to sloughing sores, and are held to prevent further destruction of the tissues, and to promote the separation of those already dead. These applications may be made in two ways. In one the yeast and water is added to flour till ordinary dough is made. This is applied while fermentation is progressing. In this case it is simply an application of "rising dough." By the other plan a simple bread poultice is made, the surface of which is smeared over with the yeast previously warmed.

A carrot poultice is made by first boiling the carrots till they become quite soft, after which they are mashed with a fork, and spread on linen in the ordinary way. This application is thought to make unhealthy wounds cleaner and better.

Laudanum is sometimes added to poultices to ease pain, and is especially capable of doing so when the skin is broken.

Solutions of chloride of lime or of soda may be added to poultices to destroy any offensive gases escaping from unhealthy sores.

Iodide of starch—made with two ounces of starch mixed with six ounces of boiling water to form a jelly, and added before it

cools to half an ounce of liq. iodi—has been introduced by Professor Marshall as an application to clean, sloughing sores.

This is spread on lint and applied cold.

Fomentations by means of flannel wrung out with boiling water are employed for similar purposes as poultices. They are used on account of their moisture, but especially for their warmth, and they differ from poultices in being of little weight, and consequently less likely to increase the pain of very tender parts. Hot fomentations, therefore, are used in place of poultices when we require great heat, and wish to avoid an increase of pain from the weight of the application. The flannel is wrung out by means of a wringer made of stout toweling attached to two rods. The wet flannel is placed in the linen, and this is then twisted round the fomentation very strongly, till as much as possible of the water is pressed away. This apparatus is adopted, as the fomentation when first removed from the boiling water is too hot to be held by the hands. If wrung as dry as possible, these applications may be used very hot, without any fear of scalding and blistering the skin.

When the fomentation is placed on the body, it is to be enveloped with a piece of mackintosh, and the whole tied on with bandages. As hot fomentations are used chiefly for their heat, and as they quickly cool, they must be very frequently renewed, and when their application is discontinued the skin is to be carefully wiped dry, and the part covered with a piece of flannel to prevent the patient taking cold.

Such applications, and in a less degree poultices, are very useful to relax spasm in the internal organs, and are for this purpose employed in colic of the intestines, and in renal and biliary colic. They are also used when the inflammation, or other conditions which need them, is very extensive, as then a poultice of such a size as required would be heavy and uncomfortable. Thus, these lighter applications are employed when a limb is extensively affected with erysipelas, or when the tissues have been widely contused, and have become inflamed.

If on a hot fomentation of the above description twenty or thirty drops of turpentine be sprinkled, we obtain a good counter-

irritant, which may be successfully employed when a stimulating action, combined with a warm soothing one, is desired.

Sometimes it is desired to apply heat to a part of the surface of the body, but at the same time it is important to avoid the relaxation of the tissues which moisture would produce. Then dry, strongly-heated, applications are used. These may be made of various substances. Flannel, strongly heated before the fire, is sometimes employed, but this application very speedily loses its heat, and then becomes useless. It is, therefore, customary to make the application of substances which shall retain their warmth. Sand or chamomile flowers are sometimes chosen. They are to be strongly heated over the fire on an iron pan, and then to be run into a linen bag made for the purpose, and which has been previously heated. The bag is of such a shape and construction that the sand or chamomile flowers shall form a thickish and even layer. Each of these substances possess advantages over the other, for the sand retains the heat, but is a heavy application, while the chamomile flowers are light, but sooner lose their warmth. In preference to sand, on account of its weight, a thin piece of flat tile, heated in the oven, and wrapped in flannel, may be employed. This is light, and retains its heat for a considerable time, and is very generally at hand. Such applications are of great service in relieving spasm and its accompanying pain.

MANCHESTER ROYAL INFIRMARY

ON ENEMATA.

Injections are used for a variety of purposes. They are given to procure evacuation of the bowels, to restrain diarrhœa, to ease pain about the region of the pelvis, to destroy worms, to introduce medicines into the general system, and lastly, nutritive substances are introduced into the rectum to nourish those persons who, from any cause, cannot swallow food, or retain it on the stomach.

There are certain circumstances that require to be attended

to in the administration of enemata for each of these purposes, which will now be shortly mentioned.

First, concerning injections used to relieve the bowels. It must be clearly understood that these applications seldom act in this capacity, by merely washing away the fæces from the intestines, and this is apparent when it is recollected that they act efficiently when the fæcal matter they are used to remove is situated high up the intestines, as the transverse colon, or cæcum. They act by stimulating, probably, the whole intestinal tract to more vigorous peristaltic action, by means of which the contents are propelled along the canal, and finally expelled from the body. This increase in the activity of the vermicular action of the intestines is produced, probably, by the injected fluid distending the lower part of the large gut, by which distension the intestines, far beyond the point to which the injection reaches, are stimulated to strong contraction, and so not only expel the newly-introduced fluid, but, at the same time, the natural contents of the intestines. If such a view as this be true, it follows, our object is to distend the rectum and the adjoining part of the intestine, and this can be only accomplished, when a considerable quantity of fluid is injected. An enema constantly fails from a want of attention to this circumstance; for so little fluid is introduced, that it excites scarcely any contraction, and the enema fails of its object. A large quantity—as much as two, three, or even four pints of fluid—should be introduced. Those, however, who attempted for the first time, and without due observance of certain conditions, to introduce such large quantities into the rectum, would be doomed to disappointment, and might think this recommendation arose from ignorance.

The following is the plan upon which to proceed when it is desired to give a copious injection. The nozzle of the injection-tube is, of course, passed through the sphincter of the anus, and the fluid must be then slowly pumped into the rectum. After a variable, but usually short time, the patient complains of inability to retain any more, and suffers from a strong desire to empty the bowels, with more or less severe colicky pain in the belly. The further introduction of fluid must, for a time, be

desisted from, and the patient directed to control the sphincter and prevent the escape of the fluid. Should the last direction prove an impossible one, assistance from the administrator must be afforded. This can be accomplished in several ways, all of which have for their object the strengthening the contraction of the sphincter. The simplest, but not always most successful plan, is to support firmly with the hand the perinæum and structures around the anus, which may be done with the aid of a towel doubled up, or by the bare hand. Such simple support often proves ineffectual, especially after a considerable quantity of fluid has been introduced. Such being the case, further assistance is obtained by passing through the sphincter into the rectum, alongside the nozzle of the enema-pipe, one, two, or even three fingers, as circumstances may require, and to press these with the nozzle strongly upward. Stimulated in this way, the sphincter firmly grasps the fingers which are introduced, and the escape of the fluid may be effectually prevented. Indeed, with these precautions, almost any amount of fluid may be pumped into the intestines. From time to time the patient will complain of griping pains in the stomach, and of an oppressive desire to stool. Each time such occurs the injection should be stayed awhile, and soon these symptoms pass away, when the injection may be proceeded with. After the desired quantity has been introduced, the patient must be directed to lie quite quiet, and to retain the fluid for ten minutes or more, if this be possible, as by this observance there is ensured a more extensive and more active contraction of the bowels.

It need scarcely be mentioned, if the rectum, or lower part of the large intestine, be diseased, as by cancer, or in other ways, such copious injections, as likewise the introduction of a long tube, are attended with danger.

It sometimes happens the rectum and lower part of the gut is filled to distension with fæces, against which the injected fluid juts as it is introduced, but finding no free space to hold it, and being prevented passing up the intestine, it of necessity flows back through the sphincter as fast as it is pumped in. In such a case one of two ways may be adopted. A hollow tube of some

inches in length is passed through the impacted fæces till its free extremity reaches the sigmoid flexure, or even higher, and perhaps has passed through the accumulation in the intestine. If such be the case, the injection can easily be proceeded with. This is one plan which may be followed. Should this fail, and it is highly urgent to obtain an evacuation, then the fingers, two or three, according to the degree in which the sphincter yields, are to be introduced into the rectum, and the fæces are to be withdrawn, which can be easily accomplished if the accumulated matters are hard and firm. Such obstinate constipation as we are now speaking of most commonly occurs in diabetes, when the fæces are hard and almost stone-like, and can be easily withdrawn by the fingers in the manner described. Much more may be withdrawn than is contained in the rectum, for although the intestines may be unable to force the hardened fæces through the sphincter, they are quite capable of propelling these into the rectum, and consequently, as fast as the fæces are withdrawn, fresh supplies are propelled downwards within easy reach of the fingers.

Fluids of various composition are employed as enemata. Sometimes simple warm water is used. At other times, to this soap, turpentine, or castor-oil are added, and sometimes gruel is employed. The soap and gruel are generally made use of when the other named substances, castor-oil or turpentine, are added to the injection, as they help to suspend these substances in the fluid. If it be desired to employ either castor-oil or turpentine, it must be recollected they are lighter than water, and will consequently float on its surface. If then they be poured on the whole of the fluid to be injected, although this may be well stirred, yet, long before the injection is completed, the oil will have risen to the surface of the water, and as the tube of the injection apparatus of course lies at the bottom of the vessel, the lower stratum of the fluid is first injected, while the oil or turpentine gradually sink with the surface of the fluid, and, as they do so, much of them sticks to the sides of the vessel, while that which ultimately reaches the opening in the injection-tube is the last to be injected, and only works upon the rectum and the in-

testines in the immediate neighbourhood. This, however, is not what is desired; the object should be to make the oil or the turpentine, as the case may be, rise as high up the canal as possible, and so to bathe the mucous lining of the intestines as they ascend, and work their influence on it. To ensure this the oil or turpentine must be well beaten up with 3 or 4 ounces of gruel, or soap, and water, and this is to be first introduced into the rectum, after which the water is to be pumped in, when the oil rises in the intestinal canal as high as the injected fluid reaches, and thus the desired object is attained.

Of what temperature should the water be when the injection is employed to empty the bowels? The fluid is generally used of a tepid heat, but by some it is recommended to employ it of a temperature as far different from the heat of the body as possible, as it is considered then to act more energetically on the tissues, and to excite the intestines to more vigorous action. Thus cold or hot water may be used. It may be mentioned, that very cold water may be introduced without the patient's being at all aware of the temperature of the fluid, or being at all incommoded by it.

It is inadvisable to use enemata for the above-mentioned purpose very repeatedly, or a torpid condition of the intestines will result, by which the constipation will ultimately be made worse instead of better.

Large quantities of water, as we have said, are employed to unload the bowels; but this is not the sole use of a free injection, for, if used comfortably warm, this application is excessively soothing to the intestines and also to the organs in their neighbourhood. Thus the pain of cancer, both of the intestines or in the organs near it, may often be much mitigated by warm injections. In this disease there is sometimes a very distressing desire to stool with much straining, without any riddance of fæces. Such painful and annoying symptoms may be allayed by these injections, and much comfort brought to the patient. Pain in the bladder, or in the prostate, when this is inflamed, or the seat of an abscess, pain in the uterus, and other pelvic and abdominal organs may often be lessened or removed by warm injections.

In some instances such injections appear to prove beneficial to the kidney in suppression of the urine, and to bring back to these important organs their functions.

When used for these latter-named purposes, the very large quantities recommended above need not be given; one or two pints will be here sufficient.

Injections are often used with great success to restrain obstinate or dangerous diarrhœa. Used for this purpose it is by no means necessary for the injection to reach that part of the intestines upon which the diarrhœa depends. Thus, these applications are quite as successful in checking diarrhœa which depends on ulceration of the small, as on the large intestines. The good, therefore, which such injections work is owing to a close sympathy between the different parts of the intestines, by means of which impressions made on one part are shared by the rest. One other circumstance it is necessary to name in connection with these injections, after which the method of administering them will be at once comprehended. The circumstance referred to is this, that when employed to restrain diarrhœa it is desirable the injection should be retained as long as possible, in order that the intestines may be as much influenced by it as possible. It is necessary, therefore, for a small quantity only to be injected, otherwise the intestine is stimulated to contract, and expel the enema. An ounce, or at most two ounces, are sufficient for an adult, and very generally all which is desired may be obtained by the smaller quantity. These injections may be repeated several times a day, according to the urgency of the diarrhœa.

The material used in such enemata is starch, of the consistence of cream, and at a temperature of about 100°. Often simply composed of this substance, an injection will prove effectual, but its astringent sedative action may be much heightened by the addition of some drops of laudanum, graduated in quantity to the age and condition of the patient. A still more astringent injection is obtained if to the last-named one there be added some acetate of lead, or sulphate of copper. Such injections may be used to check acute diarrhœa, especially when no time is to be lost. The choleraic diarrhœa of children, which so rapidly proves fatal

unless speedily restrained, may be well combated by these injections, and many a life is saved by them. The diarrhœa of typhoid fever, which, if excessive, so much adds to the dangers of the patient, will generally temporarily yield to the employment of these applications, and the good effects may be continued by their repetition. The diarrhœa of phthisis is also generally amenable to these enemata.

Injections are not uncommonly used to relieve pain in the abdomen or in the pelvic organs. This subject has already received sufficient attention in the section treating of opium and belladonna. Thus to these articles we refer our readers.

They are also largely used to destroy thread-worms. These worms infest the rectum and the intestines in its immediate neighbourhood, but occur in no other part of the canal.

The object of the injection is to remove these entozoa, by coming into contact with them and destroying them. Consequently it is necessary that a sufficient quantity of fluid to reach a little higher than the rectum should be injected. For an adult, half a pint is sufficient, and of course for a child less must be used. To the water injected various substances are added, with the object of destroying the worms by coagulating the albuminous structures of their bodies, or in other ways. Common salt, tincture of sesquichloride of iron, lime water, quassia, and various other similar acting substances, may be employed. Such injections are always successful in temporarily removing the worms, and so afford relief for a time. But in the treatment of this affection it must always be recollected the state of the mucous coat of the intestines plays an important part in the production of worms, which must be remedied if a permanent relief is to be obtained.

It is important not to use too concentrated solutions, otherwise inflammation, perhaps severe enough to result in a slough, will be produced in the rectum and margins of the anus. A teaspoonful of salt, or a drachm of the tincture of steel, to half a pint of water is sufficiently strong to effect the destruction of these delicately formed animals.

Of the application of medicines in enemata to affect the system generally, we have already spoken, in the sections treating

separately of each remedy, and therefore nothing further need be said on this subject at the present place.

Food is sometimes injected into the rectum to afford nourishment to the body. It is, of course, necessary such enemas should be retained, and therefore they should not exceed three or four ounces. The food employed in this way must be of a bland, unirritating nature, or otherwise the lining membrane of the rectum is irritated and inflamed, a condition of the parts which prevents the absorption of the nutritive matters. It sometimes happens even four ounces cannot be retained, and this inability to hold the fluids in the rectum is more liable to occur after injections have been for some time continued.

Before such enemata are given, it must be ascertained that the rectum is empty, and not filled with fæces.

Astringent and stimulating injections, composed of a pint of water, and containing ten to twenty grains of sulphate of copper, or corresponding quantities of nitrate of silver and sulphate of zinc, prove of great service in restraining the troublesome diarrhœa, with straining on passing the motions, of chronic dysentery. Large emollient enemata also prove useful, especially in the earlier stages of this disease.

POSOLOGICAL TABLE.

(From Dr. Garrod's] *Materia Medica.*)

Absinthium (in powder)	20 gr. to 40 gr.
Acetum	1 fl. drm. to 2 fl. drm., diluted.
Acetum Scillæ	15 min. to 40 min.
Acidum Aceticum Dilutum	1 fl. drm. to 2 fl. drm. freely diluted.
Acidum Arseniosum	$\frac{1}{60}$ gr. $\frac{1}{24}$ gr. $\frac{1}{12}$ gr.
Acidum Benzoicum	10 gr. to 15 gr.
Acidum Carbolicum	1 gr. to 3 gr.
Acidum Citricum	10 gr. to 30 gr.
Acidum Gallicum	2 gr. to 10 gr. or more.
Acidum Hydrochloricum Dilutum ..	10 min. to 30 min., freely diluted.
Acidum Hydrocyanicum Dilutum ..	2 min. to 8 min.
Acidum Nitricum	1 min. to 5 min.
Acidum Nitricum Dilutum	10 min. to 30 min.
Acidum Nitro-Hydrochloricum Dilutum	5 min. to 20 min., freely diluted.
Acidum Phosphoricum Dilutum ..	13 min. to 30 min., freely diluted.
Acidum Sulphuricum Dilutum ..	5 min. to 30 min.
Acidum Sulphuricum Aromaticum. .	5 min. to 30 min.
Acidum Sulphurosum	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Acidum Tannicum	2 gr. to 10 gr. or more.
Acidum Tartaricum	10 gr. to 30 gr.
Aconitum (leaves)	2 gr. to 10 gr.
Æther	20 min. to 60 min.
Aloe Barbadensis (in powder) ..	2 gr. to 6 gr.
Aloe Socotrina (in powder)	2 gr. to 6 gr.

Alumen (as an astringent)	10 gr. to 20 gr.
Alumen (as a purgative)	30 gr. to 60 gr.
Ammoniacum (the gum resin) ..	10 gr. to 20 gr.
Ammoniæ Benzoas	10 gr. to 20 gr.
Ammoniæ Bicarbonas	10 gr. to 30 gr.
Ammoniæ Carbonas (as a stimulant)	3 gr. to 10 gr.
Ammoniæ Carbonas (as an emetic)..	30 gr. freely diluted.
Ammonii Chloridum..	5 gr. to 30 gr.
Ammoniæ Phosphas..	5 gr. to 20 gr.
Ammonii Bromidum..	2 gr. to 20 gr.
Antimonii Oxidum	1 gr. to 4 gr.
Antimonium Nigrum	1 gr. to 5 gr.
Antimonium Tartaratum (as a diaphoretic expectorant)	$\frac{1}{16}$ gr. to $\frac{1}{6}$ gr.
Antimonium Tartaratum (as a vascular depressant or sedative) ..	$\frac{1}{6}$ gr. to 2 gr.
Antimonium Tartaratum (as an emetic)	1 gr. to 3 gr.
Aqua	ad libitum.
Aqua Anethi..	1 fl. oz. to 2 fl. oz.; for infants, 1 fl. drm. to 2 fl. drm.
Aqua Camphoræ	1 fl. oz. to 2 fl. oz.
Aqua Carui	1 fl. oz. to 2 fl. oz.
Aqua Cinnamomi	1 fl. oz. to 2 fl. ox.
Aqua Fœniculi	1 fl. oz. to 2 fl. oz.
Aqua Floris Aurantii	1 fl. oz. to 2 fl. oz.
Aqua Laurocerasi	5 min. to 30 min.
Aqua Menthæ Piperitæ	1 fl. oz. to 2 fl. oz.
Aqua Menthæ Viridis	1 fl. oz. to 2 fl. oz.
Aqua Pimentæ	1 fl. oz. to 2 fl. oz.
Aqua Rosæ	1 fl. oz. to 2 fl. oz.
Aqua Sambuci	1 fl. oz. to 2 fl. oz.
Argenti Nitras	$\frac{1}{6}$ gr. to $\frac{1}{3}$ gr.
Argenti Oxidum	$\frac{1}{2}$ gr. to 2 gr.
Assafœtida (the gum resin).. ..	5 gr. to 20 gr.
Aurum (in powder)	$\frac{1}{4}$ gr. to 1 gr.
Auri Teroxidum	$\frac{1}{10}$ gr. and upwards.

Auri Terchloridum	$\frac{1}{20}$ gr. and upwards.
Auri et Sodii Chloridum	$\frac{1}{15}$ gr. and upwards.
Balsamum Peruvianum	10 min to 15 min.
Balsamum Tolutanum	10 gr. to 20 gr.
Barii Chloridum	$\frac{1}{2}$ gr. to 2 gr.
Beberiæ Sulphas	1 gr. to 20 gr.
Benzoinum (the balsam)	10 gr. to 30 gr.
Bismuthi Carbonas	5 gr. to 20 gr.
Bismuthi Subnitras	5 gr. to 20 gr.
Borax	5 gr. to 40 gr.
Bucco (powdered leaves)	20 gr. to 40 gr.
Calcii Chloridum	10 gr. to 20 gr.
Calcis Carbonas Precipitata.. ..	10 gr. to 60 gr.
Calcis Phosphas	10 gr. to 20 gr.
Calomelas (as a purgative)	2 gr. to 5 gr.
Calomelas (as an alterative) ..	$\frac{1}{2}$ gr. to 1 gr., frequently repeated.
Calumba (in powder)	10 gr. to 20 gr.
Cambogia (the powdered resin) ..	1 gr. to 4 gr.
Camphora	1 gr. to 10 gr.
Canella (in powder)	15 gr. to 30 gr.
Capsicum (in powder)	$\frac{1}{2}$ gr. to 1 gr.
Carbo Animalis Purificatus	20 gr. to 60 gr.
Carbo Animalis Purificatus (as an antidote)	$\frac{1}{2}$ oz. to 2 oz.
Carbo Ligni	20 gr. to 60 gr.
Cardamomum (powdered Cardamoms)	5 gr. to 20 gr.
Caryophyllum (cloves in powder) ..	5 gr. to 20 gr.
Cascarilla (powdered bark)	10 gr. to 30 gr.
Cassia (the prepared pulp)	120 gr. and upwards.
Castoreum (in substance)	5 gr. to 10 gr.
Catechu (in powder)	10 gr. to 30 gr.
Cerevisiæ Fermentum	$\frac{1}{2}$ oz. to 1 oz.
Cerii Oxalas	1 gr. to 2 gr.
Chloroformum	3 min. to 10 min.
Cinchona (the powdered bark) ..	10 gr. to 60 gr.

Cinchoniæ Sulphas	1 gr. to 10 gr.
Cinchonidinæ Sulphas	1 gr. to 10 gr.
Cinchoniæ Hydrochloras	1 gr. to 10 gr.
Cinnamomum (powdered bark) ..	10 gr. to 30 gr.
Colchicum (the powdered corm) ..	2 gr. to 8 gr.
Colocynth (the powdered pulp) ..	2 gr. to 8 gr.
Confectio Opii	5 gr. to 20 gr.
Confectio Piperis	60 gr. to 120 gr.
Confectio Rosæ Caninæ	60 gr. or more.
Confectio Rosæ Gallicæ	60 gr. or more.
Confectio Scammonii	10 gr. to 30 gr. or more.
Confectio Sennæ	60 gr. to 120 gr.
Confectio Sulphuris	60 gr. to 120 gr.
Confectio Terebinthinæ	60 gr. to 120 gr.
Conii Folia	2 gr. to 8 gr.
Copaiba	½ fl. drm. to 1 fl. drm.
Copaibæ Oleum	5 min. to 20 min.
Coriandrum (the powdered fruit) ..	10 gr. to 30 gr.
Cortex Winteri	30 gr. to 60 gr.
Creosotum	1 min. to 3 min.
Creta Præparata	10 gr. to 60 gr.
Crocus (dried)	20 gr. upwards.
Cubeba (the powder)	30 gr. to 120 gr.
Cubebæ Oleum	5 min. to 20 min.
Cupri Sulphas (as an astringent or tonic)	¼ gr. to 2 gr.
Cupri Sulphas (as an emetic) ..	5 gr. to 10 gr.
Cusparia (in powder)	10 gr. to 40 gr.
Cusso	¼ oz. to ½ oz.
Decoctum Aloes Compositum ..	½ fl. oz. to 2 fl. oz.
Decoctum Cetrariæ	1 fl. oz. to 2 fl. oz.
Decoctum Chimaphilæ (*Lond.* 1851)	1 fl. oz. to 2 fl. oz.
Decoctum Cinchonæ Flavæ	1 fl. oz. to 2 fl. oz.
Decoctum Cydonii (*Lond.* 1851) ..	1 fl. oz. to 4 fl. oz.
Decoctum Granati Radicis	1 fl. oz. to 2 fl. oz.
Decoctum Hæmatoxyli	1 fl. oz. to 2 fl. oz.
Decoctum Hordei	ad libitum.

Decoctum Pareiræ	1 fl. oz. to 2 fl. oz.
Decoctum Quercûs	1 fl. oz. to 2 fl. oz.
Decoctum Sarsæ	2 fl. oz. to 10 fl. oz.
Decoctum Sarsæ Compositum ..	2 fl. oz. to 10 fl. oz.
Decoctum Scoparii	2 fl. oz. to 4 fl. oz.
Decoctum Taraxaci	2 fl. oz. to 4 fl. oz.
Decoctum Tormentillæ (*Lond.* 1851)	1 fl. oz. to 2 fl. oz.
Decoctum Ulmi	2 fl. oz. to 4 fl. oz.
Digitalinum	$\frac{1}{60}$ gr. to $\frac{1}{30}$ gr.
Digitalis Folia	$\frac{1}{2}$ gr. to $1\frac{1}{2}$ gr.
Elaterium	$\frac{1}{16}$ gr. to $\frac{1}{2}$ gr.
Ergota (the powdered ergot) ..	20 gr. to 30 gr.
Essentia Anisi	10 min. to 20 min.
Essentia Menthæ Piperitæ	10 min. to 20 min.
Extractum Aconiti (from juice) ..	1 gr. to 2 gr.
Extractum Aloes Barbadensis ..	2 gr. to 6 gr.
Extractum Aloes Socotrinæ ..	2 gr. to 6 gr.
Extractum Anthemidis	2 gr. to 10 gr.
Extractum Belæ Liquidum	1 fl. drm. to 2 fl. drm.
Extractum Belladonnæ	$\frac{1}{4}$ gr. to 1 gr.
Extractum Calumbæ	2 gr. to 10 gr.
Extractum Cannabis Indicæ ..	$\frac{1}{4}$ gr. to 1 gr.
Extractum Cinchonæ Flavæ Liquidum	10 min. to 33 min.
Extractum Colchici	$\frac{1}{2}$ gr. to 2 gr.
Extractum Colchici Aceticum ..	$\frac{1}{2}$ gr. to 2 gr.
Extractum Colocynthidis Compositum	3 gr. to 10 gr.
Extractum Conii	2 gr. to 6 gr.
Extractum Ergotæ Liquidum ..	10 min. to 30 min.
Extractum Filicis Liquidum ..	15 min. to 30 min.
Extractum Gentianæ	2 gr. to 10 gr.
Extractum Glycyrrhizæ	10 gr. to 30 gr.
Extractum Hæmatoxyli	10 gr. to 30 gr.
Extractum Hyoscyami	5 gr. to 10 gr.
Extractum Jalapæ	5 gr. to 15 gr.
Extractum Krameriæ	5 gr. to 20 gr.

Extractum Lactucæ	5 gr. to 15 gr.
Extractum Lupuli	5 gr. to 15 gr.
Extractum Nucis Vomicæ	½ gr. to 2 gr.
Extractum Opii	½ gr. to 2 gr.
Extractum Opii Liquidum	10 min. to 40 min.
Extractum Papaveris	2 gr. to 5 gr.
Extractum Pareiræ	10 gr. to 20 gr.
Extractum Pareiræ Liquidum	½ fl. drm. to 2 fl. drm.
Extractum Physostigmatis	$\frac{1}{16}$ gr. to ¼ gr.
Extractum Quassiæ	3 gr. to 5 gr.
Extractum Rhei	5 gr. to 15 gr.
Extractum Sarsæ Liquidum	2 fl. drm. to 4 fl. drm.
Extractum Stramonii	¼ gr. to ½ gr.
Extractum Taraxaci	5 gr. to 30 gr.
Fel Bovinum (purif.)	5 gr. to 10 gr.
Ferri Arsenias	$\frac{1}{16}$ gr. to ½ gr.
Ferri Carbonas Saccharata	5 gr. to 20 gr.
Ferri et Ammoninæ Citras	5 gr. to 10 gr.
Ferri et Quiniæ Citras	5 gr. to 10 gr.
Ferri Iodidum	1 gr. to 5 gr.
Ferri Oxidum Magneticum	5 gr. to 10 gr.
Ferri Perchloridi Liquor	3 min. to 10 min.
Ferri Pernitratis Liquor	30 min. to 1 fl. drm.
Ferri Peroxidum	10 gr. to 60 gr. or more.
Ferri Peroxidum Humidum	¼ oz. to ½ oz.
Ferri Peroxidum Hydratum	5 gr. to 30 gr.
Ferri Phosphas	5 gr. to 10 gr.
Ferri Sulphas	1 gr. to 5 gr.
Ferri Sulphas Exsiccata	½ gr. to 3 gr.
Ferri Sulphas Granulata	1 gr. to 5 gr.
Ferrum Redactum	1 gr. to 5 gr.
Ferrum Tartaratum	5 gr. to 10 gr.
Filix (of the powdered root)	60 gr. to 120 gr.
Galbanum (the gum resin)	10 gr. to 30 gr.
Gentiana (in powder)	10 gr. to 30 gr.
Glycerinum	1 fl. drm. to 2 fl. drm.
Guaiacum (the powdered resin)	10 gr. to 30 gr.

Hydrargyrum cum Cretâ	3 gr. to 8 gr.
Hydrargyri Sulphuretum (for fumigation)	30 gr. and upwards.
Hydrargyrum Iodidum Rubrum ..	$\frac{1}{16}$ gr. to $\frac{1}{4}$ gr.
Hydrargyrum Iodidum Viride ..	1 gr. to 3 gr.
Hydrargyri Perchloridum	$\frac{1}{16}$ gr. to $\frac{1}{8}$ gr.
Hydrargyri Subchloridum	$\frac{1}{2}$ gr. to 5 gr.
Infusum Anthemidis..	1 fl. oz. to 4 fl. oz.
Infusum Aurantii	1 fl. oz. to 2 fl. oz.
Infusum Aurantii Compositum ..	1 fl. oz. to 2 fl. oz.
Infusum Buchu	1 fl. oz. to 4 fl. oz.
Infusum Calumbæ	1 fl. oz. to 2 fl. oz.
Infusum Caryophylli	1 fl. oz. to 4 fl. oz.
Infusum Cascarillæ	1 fl. oz. to 2 fl. oz.
Infusum Catechu	1 fl. oz. to 2 fl. oz.
Infusum Chiratæ	1 fl. oz. to 2 fl. oz.
Infusum Cinchonæ Flavæ	1 fl. oz. to 2 fl. oz.
Infusum Cuspariæ	1 fl. oz. to 2 fl. oz.
Infusum Cusso	4 fl. oz. to 8 fl. oz.
Infusum Digitalis	2 fl. drm. to 4 fl. drm.
Infusum Dulcamaræ..	1 fl. oz. to 2 fl. oz.
Infusum Ergotæ	1 fl. oz. to 2 fl. oz.
Infusum Gentianæ Compositum ..	1 fl. oz. to 2 fl. oz.
Infusum Krameriæ	1 fl. oz. to 2 fl. oz.
Infusum Lini	ad libitum.
Infusum Lupuli	1 fl. oz. to 2 fl. oz.
Infusum Maticæ	1 fl. oz. to 2 fl. oz.
Infusum Quassiæ	1 fl. oz. to 2 fl. oz.
Infusum Rhei	1 fl. oz. to 2 fl. oz.
Infusum Rosæ Acidum	1 fl. oz. to 2 fl. oz.
Infusum Senegæ	1 fl. oz. to 2 fl. oz.
Infusum Sennæ	1 fl. oz. to 2 fl. oz.
Infusum Serpentariæ	1 fl. oz. to 2 fl. oz.
Infusum Uvæ Ursi	1 fl. oz. to 2 fl. oz.
Infusum Valerianæ	1 fl. oz. to 2 fl. oz.
Inula (in powder)	30 gr. to 60 gr.
Iodum	$\frac{1}{2}$ gr., gradually increased.

Ipecacuanha (in powder, as an emetic)	15 gr. to 30 gr.
Ipecacuanha (in powder, as an expectorant)	½ gr. to 2 gr.
Jalapa (powder)	10 gr. to 30 gr.
Jalapæ Resina	2 gr. to 5 gr.
Kamela	30 gr. to ¼ oz.
Kino (in powder)	10 gr. to 30 gr.
Krameria (in powder)	20 gr. to 60 gr.
Lactucarium	5 gr. to 30 gr.
Liquor Ammoniæ	10 min. to 30 min.
Liquor Ammoniæ Fortior	3 min. to 10 min., freely diluted.
Liquor Ammoniæ Acetatis	2 fl. drm. to 6 fl. drm.
Liquor Ammoniæ Citratis	2 fl. drm. 6 fl. drm.
Liquor Arsenicalis	2 min. to 8 min.
Liquor Arsenici et Hydrargyri Hydriodatis (Donovan's solution) ..	10 min. to ½ fl. drm.
Liquor Arsenici Hydrochloricus ..	2 min. to 8 min.
Liquor Bismuthi et Ammoniæ Citratis	½ fl. drm. to 1 fl. drm.
Liquor Calcis	1 fl. oz. to 4 fl. oz.
Liquor Calcis Saccharatus	15 min. to 60 min.
Liquor Chlori	10 min. to 20 min.
Liquor Ferri Perchloridi	10 min. to 30 min.
Liquor Ferri Pernitratis	10 min. to 40 min.
Liquor Hydrargyri Perchloridi ..	½ fl. drm. to 2 fl. drm.
Liquor Lithiæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Magnesiæ Carbonatis ..	1 fl. oz. to 2 fl. oz.
Liquor Morphiæ Acetatis	10 min. to 60 min.
Liquor Morphiæ Hydrochloratis ..	10 min. to 60 min.
Liquor Potassæ	15 min. to 60 min.
Liquor Potassæ Effervescens ..	5 fl. oz. to 10 fl. oz.
Liquor Potassæ Permanganatis ..	2 fl. drm. to 4 fl. drm.
Liquor Sodæ	10 min. to 1 fl. drm.
Liquor Sodæ Arseniatis	5 min. to 10 min.
Liquor Sodæ Chlorate	10 min. to 20 min.

Liquor Sodæ Effervescens	5 fl. oz. to 10 fl. oz.
Liquor Strychniæ	5 min. to 10 min.
Lithiæ Carbonas	3 gr. to 6 gr.
Lithiæ Citras..	5 gr. to 10 gr.
Lupulin	5 gr. to 10 gr.
Magnesia	10 gr. to 60 gr.
Magnesiæ Carbonas	10 gr. to 60 gr.
Magnesiæ Carbonas Levis	10 gr. to 60 gr.
Magnesiæ Sulphas	60 gr. to ½ oz. or more.
Manganesii Sulphas (as a purgative)	60 gr. to 120 gr.
Manna	60 gr. to 1 oz.
Mastiche (resin, in powder) ..	20 gr. to 40 gr.
Matico (in powder)	30 gr. to 60 gr.
Mistura Ammoniaci	½ fl. oz. to 1 fl. oz.
Mistura Amygdalæ	1 fl. oz. to 2 fl. oz.
Mistura Creasoti	1 fl. oz. to 2 fl. oz.
Mistura Cretæ	1 fl. oz. to 2 fl. oz.
Mistura Ferri Aromatica	1 fl. oz. to 2 fl. oz.
Mistura Ferri Composita	1 fl. oz. to 2 fl. oz.
Mistura Gentianæ	½ fl. oz. to 1 fl. oz.
Mistura Guaiaci	½ fl. oz. to 2 fl. oz.
Mistura Scammonii	½ fl. oz. to 2 fl. oz. (for a child).
Mistura Sennæ Composita	1 fl. oz. to 1½ fl. oz.
Mistura Spiritûs Vini Gallici ..	1 oz. to 2 oz.
Morphiæ Acetas	⅛ gr. to ½ gr.
Morphiæ Hydrochloras	⅛ gr. to ½ gr.
Moschus	5 gr. to 10 gr.
Mucilago Acaciæ	ad libitum.
Mucilago Tragacanthæ	1 fl. oz. and upwards.
Myristica (in powder)	5 gr. to 15 gr.
Myrrh (in powder)	10 gr. to 30 gr.
Nux Vomica (in powder)	1 gr. to 3 gr.
Oleum Amygdalæ	1 fl. drm. to ½ fl. oz.
Oleum Anethi	1 min. to 5 min.
Oleum Anisi	1 min. to 5 min.
Oleum Anthemidis	1 min. to 5 min.

Oleum Cajuputi	1 min. to 5 min.
Oleum Carui	1 min. to 5 min.
Oleum Caryophylli	1 min. to 5 min.
Oleum Cinnamomi	1 min. to 5 min.
Oleum Copaibæ	5 min. to 20 min.
Oleum Coriandri	1 min. to 5 min.
Oleum Crotonis	$\frac{1}{3}$ min. to 1 min.
Oleum Cubebæ	5 min. to 20 min.
Oleum Juniperi	1 min. to 10 min.
Oleum Lavandulæ	1 min. to 5 min.
Oleum Limonis	1 min. to 5 min.
Oleum Menthæ Piperitæ	1 min. to 5 min.
Oleum Menthæ Viridis	1 min. to 5 min.
Oleum Morrhuæ	1 fl. drm. to 8 fl. drm.
Oleum Myristicæ	1 min. to 5 min.
Oleum Olivæ..	1 fl. drm. to 1 fl. oz.
Oleum Pimentæ	1 min. to 5 min.
Oleum Pulegii	1 min. to 5 min.
Oleum Ricini	1 fl. drm. to 8 fl. drm.
Oleum Rosmarini	1 min. to 5 min.
Oleum Rutæ	1 min. to 5 min.
Oleum Sabinæ	1 min. to 5 min.
Oleum Sassafras	1 min. to 5 min.
Oleum Terebinthinæ (as stimulant, and diuretic)	10 min. to 20 min.
Oleum Terebinthinæ (as an anthelmintic purgative)..	2 fl. drm. to 6 fl. drm.
Opium (powdered)	$\frac{1}{2}$ gr. to 2 gr.
Oxymel	1 fl. drm. to 2 fl. drm.
Oxymel Scillæ	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Pareira (in powder)	30 gr. to 60 gr.
Pepsina	15 gr. to 20 gr.
Pepsina Porci	2 gr. to 4 gr.
Petroleum	30 min. to 1 fl. drm.
Phosphorus	$\frac{1}{40}$ gr. to $\frac{1}{10}$ gr.
Pilula Aloes Barbadensis	5 gr. to 10 gr.
Pilula Aloes et Assafœtidæ	6 gr. to 10 gr.

Pilula Aloes et Ferri	5 gr. to 10 gr.
Pilula Aloes et Myrrhæ	5 gr. to 10 gr.
Pilula Aloes Socotrinæ	5 gr. to 10 gr.
Pilula Assafœtidæ Composita ..	5 gr. to 10 gr.
Pilula Cambogiæ Composita ..	5 gr. to 10 gr.
Pilula Colocynthidis Composita ..	5 gr. to 10 gr.
Pilula Colocynthidis et Hyoscyami..	5 gr. to 10 gr.
Pilula Conii Composita	5 gr. to 10 gr.
Pilula Ferri Carbonatis	5 gr. to 20 gr.
Pilula Ferri Iodidi	3 gr. to 8 gr.
Pilula Hydrargyri	3 gr. to 8 gr.
Pilula Hydrargyri Subchloridi Composita	5 gr. to 10 gr.
Pilula Ipecacuanhæ cum Scilla ..	5 gr. to 10 gr.
Pilula Plumbi cum Opio	3 gr. to 5 gr.
Pilula Quiniæ	2 gr. to 10 gr.
Pilula Rhei Composita	5 gr. to 10 gr.
Pilula Saponis Composita	3 gr. to 5 gr.
Pilula Scillæ Composita	5 gr. to 10 gr.
Pimenta (powder)	5 gr. to 20 gr.
Piper (nigrum)	5 gr. to 10 gr.
Piperina	5 gr. to 10 gr.
Plumbi Acetas	1 gr. to 4 gr.
Plumbi Iodidum	$\frac{1}{4}$ gr. to 1 gr.
Podophyllum (in powder)	10 gr. to 20 gr.
Podophylli Resina (Podophylline) ..	$\frac{1}{4}$ gr. to 1 gr.
Potassa Sulphurata	3 gr. to 6 gr., freely diluted.
Potassæ Acetas	10 gr. to 20 gr.
Potassæ Bicarbonas	10 gr. to 40 gr.
Potassæ Carbonas	10 gr. to 30 gr.
Potassæ Chloras	10 gr. to 30 gr.
Potassæ Citras	20 gr. to 60 gr.
Potassæ Nitras	10 gr. to 30 gr.
Potassæ Sulphas (as a purgative) ..	15 gr. to 60 gr.
Potassæ Tartras	60 gr. to $\frac{1}{2}$ oz.
Potassæ Tartras Acida	20 gr. to 60 gr.
Potassii Bromidum	5 gr. to 30 gr.

Potassii Iodidum	2 gr. to 10 gr.
Pulvis Amygdalæ Compositus ..	60 gr. to 120 gr.
Pulvis Antimonialis	3 gr. to 10 gr.
Pulvis Aromaticus	10 gr. to 30 gr.
Pulvis Catechu Compositus.. ..	20 gr. to 40 gr.
Pulvis Cretæ Aromaticus	10 gr. to 60 gr.
Pulvis Cretæ Aromaticus cum Opio	10 gr. to 40 gr.
Pulvis Ipecacuanhæ Compositus ..	5 gr. to 15 gr.
Pulvis Jalapæ Compositus	20 gr. to 60 gr.
Pulvis Kino Compositus	5 gr. to 20 gr.
Pulvis Opii Compositus	2 gr. to 5 gr.
Pulvis Rhei Compositus	20 gr. to 60 gr.
Pulvis Scammonii Compositus ..	10 gr. to 20 gr.
Pulvis Tragacanthæ Compositus ..	20 gr. to 60 gr.
Quassia (in powder)..	10 gr. to 20 gr.
Quiniæ Sulphas	1 gr. to 10 gr.
Quiniæ Valerianas	1 gr. to 5 gr.
Rhei Radix	5 gr. to 20 gr.
Rhus Toxicodendron (powdered leaves)	½ gr. to 1 gr.
Ruta (powdered leaves)	20 gr. to 40 gr.
Sabinæ Cacumina	4 gr. to 10 gr.
Sagapenum (the gum resin) ..	10 gr. to 30 gr.
Santonica (worm seed)	10 gr. to 60 gr.
Santoninum(Santonin—crystallised)	2 gr. to 6 gr.
Sapo Durus, or Sapo Mollis (as antacids)	5 gr. to 20 gr.
Scammoniæ Resina	3 gr. to 8 gr.
Scammonium (gum resin in powder)	5 gr. to 10 gr.
Scilla	1 gr. to 3 gr.
Senega (in powder)	20 gr. to 60 gr.
Senna (powdered leaves)	30 gr. to 120 gr.
Serpentaria (in powder)	10 gr. to 20 gr.
Simarubra (in powder)	15 gr. to 30 gr.
Sinapis (as an emetic)	from a dessert to a table-spoonful
Soda Tartarata	¼ oz. to ½ oz.

Sodæ Acetas	20 gr. to 60 gr.
Sodæ Arsenias	$\frac{1}{16}$ gr. to $\frac{1}{8}$ gr.
Sodæ Biboras	10 gr. to 60 gr.
Sodæ Bicarbonas	10 gr. to 60 gr.
Sodæ Carbonas	5 gr. to 30 gr.
Sodæ Carbonas Exsiccata	3 gr. to 10 gr.
Sodæ Citro-tartras Effervescens	60 gr. to $\frac{1}{4}$ oz.
Sodæ Phosphas	$\frac{1}{4}$ oz. to 1 oz.
Sodæ Sulphas	$\frac{1}{4}$ oz. to 1 oz.
Sodæ Sulphis.	20 gr. to 60 gr.
Sodæ Valerianas	1 gr. to 5 gr.
Spigelia (in powder)	60 gr. to 120 gr.
Spiritus Ætheris	30 min. to 90 min.
Spiritus Ætheris Nitrosi	30 min. to 2 fl. drm.
Spiritus Ammoniæ Aromaticus	30 min. to 1 fl. drm.
Spiritus Ammoninæ Fœtitus	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Spiritus Armoraciæ Compositus	1 fl. drm. to 2 fl. drm.
Spiritus Cajuputi	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Spiritus Camphoræ	10 min. to 30 min.
Spiritus Chloroformi (Chloric Ether)	20 min. to 60 min.
Spiritis Juniperi	$\frac{1}{2}$ min. to $1\frac{1}{2}$ fl. drm.
Spiritus Lavandulæ	$\frac{1}{2}$ fl. drm. to 1 fl. drm.
Spiritus Menthæ Piperitæ	30 min. to 60 min.
Spiritus Myristicæ	30 min. to 60 min.
Spiritus Rosmarini	10 min. to 50 min.
Staphisagria	3 gr. to 10 gr.
Stramonium (the leaves powdered)	1 gr. upwards.
Strychnia	$\frac{1}{30}$ gr. to $\frac{1}{12}$ gr.
Styrax Præparatus	5 gr. to 20 gr.
Succus Limonis	1 fl. drm. to 4 fl. drm.
Succus Scoparii	1 fl. drm. to $\frac{1}{2}$ fl. oz.
Succus Conii	30 min. to 60 min.
Succus Scoparii	1 fl. drm. to 2 fl. drm.
Succus Taraxaci	1 fl. drm. to 2 fl. drm.
Succus Mori	ad libitum.
Sulphide of Ammonium	3 min.
Sulphuris Iodidum	$\frac{1}{2}$ gr. to 2 gr.

Sulphur Præcipitatum	20 gr. to 1 drm.
Sulphur Sublimatum	20 gr. to 1 drm.
Sumbul (in powder)	20 gr. to 60 gr.
Syrupus	ad libitum.
Syrupus Althææ	1 fl. drm. to 1 fl. oz.
Syrupus Aurantii	1 fl. drm.
Syrupus Aurantii Floris	1 fl. drm.
Syrupus Ferri Iodidi	½ fl. drm. to 1 fl. drm.
Syrupus Ferri Phosphatis	1 fl. drm.
Syrupus Hemidesmi	1 fl. drm.
Syrupus Limonis	1 fl. drm.
Syrupus Mori	1 fl. drm.
Syrupus Papaveris	1 fl. drm.
Syrupus Rhamni	1 fl. drm.
Syrupus Rhei	1 fl. drm. to 4 fl. drm.
Syrupus Rhœados	1 fl. drm.
Syrupus Rosæ Gallicæ	1 fl. drm.
Syrupus Scillæ	½ fl. drm. to 1 fl. drm.
Syrupus Sennæ	1 fl. drm. to 4 fl. drm.
Syrupus Tolutanus	1 fl. drm.
Syrupus Violæ	½ fl. drm. to 2 fl. drm.
Syrupus Zingiberis	1 fl. drm.
Tamarindus	½ oz. and upwards.
Tinctura Aconiti	5 min. to 15 min.
Tinctura Actæa Racemosæ	30 min. to 60 min.
Tinctura Aloes	1 fl. drm. to 2 fl. drm.
Tinctura Arnicæ	1 fl. drm. to 2 fl. drm.
Tinctura Assafœtidæ	½ fl. drm. to 1 fl. drm.
Tinctura Aurantii	1 fl. drm. to 2 fl. drm.
Tinctura Belladonnæ	5 min. to 20 min.
Tinctura Benzoini Composita	½ fl. drm. to 1 fl. drm.
Tinctura Buchu	1 fl. drm. to 2 fl. drm.
Tinctura Calumbæ	½ fl. drm. to 2 fl. drm.
Tinctura Camphoræ Composita	15 min. to 1 fl. drm.
Tinctura Cannabis Indicæ	5 min. to 20 min.
Tinctura Cantharidis	5 min. to 20 min.
Tinctura Capsici	10 min. to 20 min.

Tinctura Cardamomi Composita	½ fl. drm. to 2 fl. drm.
Tinctura Cascarillæ	½ fl. drm. to 2 fl. drm.
Tinctura Castorei	½ fl. drm. to 1 fl. drm.
Tinctura Catechu	½ fl. drm. to 2 fl. drm.
Tinctura Chiratæ	½ fl. drm. to 2 fl. drm.
Tinctura Chloroformi Composita	20 min. to 60 min.
Tinctura Cinchonæ Composita	½ fl. drm. to 2 fl. drm.
Tinctura Cinchonæ Flavæ	½ fl. drm. to 2 fl. drm.
Tinctura Cinnamomi	½ fl. drm. to 2 fl. drm.
Tinctura Cocci	½ fl. drm. to 2 fl. drm.
Tinctura Colchici Seminum	10 min. to 30 min.
Tinctura Conii	20 min. to 60 min.
Tinctura Croci	½ drm to 1½ drm.
Tinctura Cubebæ	½ fl. drm. to 2 fl. drm.
Tinctura Digitalis	10 min. to 30 min.
Tinctura Ergotæ	10 min. to 1 fl. drm.
Tinctura Ferri Acetatis	5 min. to 30 min.
Tinctura Ferri Perchloridi	10 min. to 30 min.
Tinctura Gallæ	½ fl. drm. to 2 fl. drm.
Tinctura Gentianæ Composita	½ fl. drm. to 2 fl. drm.
Tinctura Guaiaci Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Hellebori (*Lond.*, 1851)	30 min. to 1 fl. drm.
Tinctura Hyoscyami	½ fl. drm. to 1 fl. drm.
Tinctura Iodi.	5 min. to 20 min.
Tinctura Jalapæ	½ fl. drm. to 2 fl. drm.
Tinctura Kino	½ fl. drm. to 2 fl. drm.
Tinctura Krameriæ	½ fl. drm. to 2 fl. drm.
Tinctura Lavandulæ Composita	½ fl. drm. to 2 fl. drm.
Tinctura Limonis	½ fl. drm. to 2 fl. drm.
Tinctura Lobeliæ	10 min. to ½ fl. drm.
Tinctura Lobeliæ Ætherea	10 min. to ½ fl. drm.
Tinctura Lupuli	½ fl. drm. to 2 fl. drm.
Tinctura Myrrhæ	½ fl. drm. to 1 fl. drm.
Tinctura Nucis Vomicæ	10 min. to 20 min.
Tinctura Opii.	5 min. to 40 min.
Tinctura Opii Ammoniata	½ fl. drm. to 1 fl. drm.
Tinctura Quassiæ	½ fl. drm. to 2 fl. drm.

Tinctura Quiniæ	½ fl. drm. to 2 fl. drm.
Tincture Rhei (as a stomachic) ..	1 fl. drm. to 2 fl. drm.
Tinctura Rhei (as a purgative) ..	4 fl. drm. to 8 fl. drm.
Tinctura Sabinæ	20 min. to 1 fl. drm.
Tinctura Scillæ	10 min. to 30 min.
Tinctura Senegæ	½ fl. drm. to 2 fl. drm.
Tinctura Sennæ	1 fl. drm. to 4 fl. oz.
Tinctura Serpentariæ	½ fl. drm. to 2 fl. drm.
Tinctura Stramonii	10 min. to 30 min.
Tinctura Sumbul	10 min. to 30 min.
Tinctura Tolutana	20 min. to 40 min.
Tinctura Valerianæ	1 fl. drm. to 2 fl. drm.
Tinctura Valerianæ Ammoniata ..	½ fl. drm. to 1 fl. drm.
Tinctura Veratri Viridis	5 min. to 20 min.
Tinctura Zingiberis	15 min. to 1 fl. drm.
Tinctura Zingiberis Fortior ..	5 min. to 20 min.
Tormentilla (in powder)	20 gr. to 60 gr.
Tragacantha (powder)	20 gr. and upwards.
Trochisci Acidi Tannici	*one* to *six*.
Trochisci Bismuthi	*one* to *six*.
Trochisci Catechu	*one* to *six*.
Trochisci Ipecacuanhæ	*one* to *three*.
Trochisci Morphiæ	*one* to *six*.
Trochisci Morphiæ et Ipecacuanhæ	*one* to *six*.
Trochisci Opii	*one* to *six*.
Trochisci Potassæ Chloratis ..	*one* to *six*.
Trochisci Ferri Redacti	*one* to *six*.
Trochisci Sodæ Bicarbonatis ..	*one* to *six*.
Uva Ursæ (powdered leaves) ..	10 gr. to 30 gr.
Valeriana (in powder)	10 gr. to 30 gr.
Veratria (the alkaloid)	$\frac{1}{12}$ gr. to $\frac{1}{6}$ gr.
Veratrum Viride (powdered rhizome)	1 gr. to 3 gr.
Vinum Aloes..	1 fl. drm. to 2 fl. drm.
Vinum Antimoniale (in febrile affections)	5 min. to 1 fl. drm. (?)
Vinum Antimoniale (as an emetic) ..	½ fl. oz. to 1 fl. oz.
Vinum Colchici	10 min. to 30 min.

Vinum Ferri	1 fl. drm. to 4 fl. drm.
Vinum Ferri Citratis	1 fl. drm. to 4 fl. drm.
Vinum Ipecacuanhæ (as an expectorant)	5 min. to 40 min.
Vinum Ipecacuanhæ (as an emetic)	3 fl. drm. to 6 fl. drm.
Vinum Opii	10 min. to 40 min.
Vinum Quiniæ	½ fl. oz. to 1 fl. oz.
Vinum Rhei	1 drm. to 2 drm.
Vinum Veratri (*Lond.*, 1851) ..	10 min. to 20 min.
Zincic Acetas	1 gr. to 2 gr.
Zincic Acetas (as an emetic) ..	10 gr. to 20 gr.
Zinci Carbonas	1 gr. to 5 gr. or more.
Zinci Chloridum	½ gr. to 1 gr. or 2 gr.
Zinci Oxidum	2 gr. to 10 gr.
Zinci Sulphas (as a tonic or astringent)	1 gr. to 2 gr.
Zinci Sulphas (as an emetic) ..	10 gr. to 30 gr.
Zinci Valerianas	1 gr. to 3 gr.
Zingiber (in powder)	10 gr. to 30 gr.

DIETARY FOR INVALIDS.

Macaroni Soup.

One and a half ounces macaroni, a piece of butter the size of a nut, salt to taste, one quart of stock. Throw the macaroni and butter into boiling water, with a pinch of salt, and simmer half an hour. When tender, drain, and cut it into thin rings or lengths, and drop it into the boiling soup. Stew gently fifteen minutes, and serve.

Barley Soup.

One pound of shin of beef, four ounces of pearl barley, one small onion, one potato, salt and pepper to taste, one and a half quart of water. Put all the ingredients into a pan, and simmer gently for four hours. Strain, return the barley, and heat up as much as required.

Bread Soup.

One pound of bread, two ounces of butter, one quart of stock. Boil the bread with the butter in stock. Beat the whole with a spoon or fork, and keep it boiling till the bread and stock are thoroughly mixed. Strain, season with salt, and serve.

Tapioca Soup.

Two and a half ounces of tapioca, one quart of stock. Put the tapioca into *cold* stock, and bring it gradually to a boil. Simmer gently till tender, and serve.

Sardinian Soup.

Two eggs, a quarter of a pint of cream, one ounce of fresh butter, salt and pepper to taste, a little flour to thicken. Beat the eggs, put them into a stewpan, and add the cream, butter and seasoning, stir in as much flour as will bring it to consistency of dough, make it into balls the size and shape of a nut, fry them in butter, and put them into a basin of any sort of soup or broth, to which they make a very nice addition.

Stewed Oysters.

Half a pint of oysters, half an ounce of butter, flour, one-third of a pint of cream, cayenne and salt to taste. Scald the oysters in their own liquor, take them out,

beard them, and strain the liquor. Put the butter into a stewpan, dredge in sufficient flour to dry it up, add the oyster liquor, and stir it over a sharp fire with a wooden spoon. When it comes to a boil, add the cream, oysters, and seasoning. Let all simmer for one or two minutes, but *not longer*, or the oysters will harden. Serve on a hot dish, with croutons, or toasted sippets of bread. A quarter of a pint of oysters, the other ingredients in proportion, make a dish large enough for one person.

Panada.

Take the crumbs of a penny roll and soak it in milk for half an hour, then squeeze the milk from it; have ready an equal quantity of chicken or veal, *scraped* very fine with a knife; pound the bread crumbs and meat together in a mortar. It may be cooked either mixed with veal or chicken broth, or by taking it up in two teaspoons in pieces the shape of an egg after seasoning it, poached like an egg, and served on mashed potato.

Macaroni.

Two ounces of macaroni, a quarter of a pint of milk, a quarter of a pint of good beef gravy, the yolk of one egg, two tablespoonfuls of cream, half an ounce of butter.

Wash the macaroni, and boil it in the gravy and milk till *quite* tender.

Drain it, put the macaroni into a very hot dish and put by the fire. Beat the yolk of the egg with the cream and two tablespoonfuls of the liquor the macaroni was boiled in. Make this sufficiently hot to thicken, *but do not allow it to boil* or it will be spoiled; pour it over the macaroni, and grate over the whole a little finely grated Parmasan cheese, or the macaroni may be served as an accompaniment to minced beef, without the cheese; or it may be taken alone, with some good gravy in a tureen, served with it.

Stewed Eels.

One eel, half a pint strong stock, two tablespoonfuls of cream, half a glass of port wine, thickening of flour, a little cayenne.

Wash and skin the eel, cut it in pieces about two inches long; pepper and salt them, and lay them in a stewpan. Pour over the stock and add the wine. Stew gently for 25 minutes or half an hour, lift the pieces carefully on to a very hot dish, and place it by the fire, strain the gravy, stir into the cream sufficient flour to thicken it, mix with the gravy, boil for two minutes, and add a little cayenne. Pour over the eels and serve.

Minced Fowl and Egg.

Cold roast fowl. A hard boiled egg, salt, pepper, or cayenne, to taste; three tablespoonfuls of new milk or cream, half an ounce of butter, one tablespoonful of flour, a teaspoonful of lemon-juice.

Cut up and mince the fowl and remove all skin and bones; put the bones, skin, and trimmings into a stewpan, with one small onion and nearly half a pint

of water ; let this stew for an hour, then strain the liquor, chop the egg small, mix with the fowl, add salt and pepper, put in the gravy and other ingredients, let the whole just boil, and serve with sippets of toasted bread.

Fowl and Rice.

A quarter of a pound of rice, one pint stock or broth, one and a half ounce of butter, minced fowl, egg and bread crumbs.

Put the rice into the above proportion of cold stock or broth, let it boil very gently for half an hour, then add the butter, and simmer it till quite dry and soft. When cold, make it into balls, hollow out the inside, and fill them with mince made in the same way as the above, but a little stiffer ; cover with rice, dip the balls into egg, sprinkle with bread crumbs, and fry a nice brown ; a little cream stirred into the rice before it cools improves it very much.

Chicken and Rice.

Take the meat of boiled chicken and cut it up. Have ready some rice well creed and seasoned with salt put round a small flat dish or vegetable dish, warm up the chicken in a little good gravy, and put in the middle of the dish with the rice round it.

Macaroni boiled in Milk.

Two ounces of macaroni, three-quarters of a pint of new milk, a little lemon-rind, a little white sugar.

Put the milk into a saucepan with the lemon-rind, bring it to boiling point and drop in the macaroni. Let it swell gradually over the fire till *quite* tender, but do not allow the pipes to break.

Should the milk not be sufficient, add a little more. The lemon-peel should be taken out before the macaroni is put into the milk. Serve hot with fruit syrup, or cold, with custard poured over it.

Rice Cream, 1.

To one pint of new milk add a quarter of a pound of ground rice, a lump of butter the size of a walnut, a little lemon-peel, and a tablespoonful of powdered sugar.

Boil them together for five minutes, and then add half an ounce of isinglass which has been dissolved, and let the mixture cool. When cool, add a half pint of good cream whisked to a froth, mix all together, and set it in a very cool place, or on ice for a time ; when used, turn it out of the bason into a dish, and pour fruit juice round it, or some stewed apple or pear may be served with it.

Rice Cream, 2.

Quarter of a pound whole rice, well creed in milk and put in a sieve to drain and cool, a gill of good cream whisked to a froth, mix with the rice, and add a wine-glass of sherry, a little powdered sugar, and a teaspoonful of lemon-juice.

Light Pudding.

One tablespoonful of ground rice boiled very smoothly in new milk, let it get *quite cold*, then add two eggs, very well beat up, a lump of white sugar, and, if liked, a dessert spoonful of brandy. Line a small tart dish (sufficient for one person) with paste, put in the pudding, and bake quickly. Serve the moment it is ready, for it falls directly.

Rice and Apple.

Boil about three tablespoonfuls of rice in a pint and a half of new milk, and simmer till the rice is *quite* tender, stirring it from time to time; have ready some apples, peeled, cored, and stewed to a pulp, and sweetened with a very little loaf sugar; put the rice round a plate, and the apple in the middle, and serve with a little of the following preparation of milk in a cream jug, if liked.

Milk for Puddings or Stewed Fruit.

Boil a strip of lemon and two cloves in a pint of milk, mix half a teaspoonful of arrowroot in a little cold milk, and add it to the boiling milk, stir it till about the consistency of cream; have ready the yolks of three eggs, beaten up well in a little milk, take the hot milk off the fire, and as it cools add the eggs and a tablespoonful of orange-flower water, stirring it constantly till quite cool. Put it in a very cold place till required for use.

Cream for Stewed Fruit.

An ounce and a half of isinglass boiled over a slow fire in a pint and a half of water, to half pint, strain and sweeten, put in a glass of sherry, and stir in half a pint of good cream; stir till cold.

Custard Pudding (*Baked*).

Half pint of milk, or a little more, two eggs, warm the milk, whisk the eggs, yolks and whites, pour the milk to them, stirring all the while, have ready a small tart dish, lined at the edges with paste ready baked, pour the custard into the dish, grate a little nutmeg over the top, and bake in a very slow oven for half an hour.

Boiled Custard Pudding.

Prepare the custard as above. Butter a small basin that will exactly hold it, put in the custard, and tie a floured cloth over it; plunge it into boiling water, turn it for about a few minutes. Boil it slowly for half an hour, turn it out and serve.

Baked Bread Pudding.

Half pint of new milk, a quarter of a pound bread crumbs, two eggs, one ounce of butter, sugar to taste.

Boil the milk and pour it over the bread crumbs, and let them soak for half an hour. Beat the eggs, mix these with the bread crumbs, add the sugar and butter, stir well till thoroughly mixed. Butter a breakfast cup or small pudding mould, fill it a little more than half full with the mixture, and bake in a moderate oven for about 20 minutes.

Serve with the following sauce.

Sago Sauce for Boiled or Baked Puddings.

One dessert spoonful of sago, not quite half a pint of water, one tablespoonful of sherry, one teaspoonful of lemon-juice, and a little lemon-rind, sugar to taste.

Wash the sago, then put it into a saucepan with the water and lemon-peel; let it simmer for ten minutes, then take out the lemon-peel, add the other ingredients, boil and serve.

Semolina Pudding.

One ounce of semolina, half-pint of milk, one ounce of butter, two eggs, sugar to taste.

Heat the milk, and then mix with it the semolina, sugar, and butter. Stir these over the fire for a few minutes, then take it off and mix with it the eggs, which should be well beaten.

Butter a small tart dish, line it with puff paste, put in the pudding, and bake in a slow oven.

Rice Pudding.

Two ounces of whole rice, three-quarters of a pint of milk, one ounce of butter, two eggs, sugar to taste, flavouring of lemon-peel. Let the rice swell in the milk over a slow fire, putting in a few small strips of lemon-peel, stir in the butter, and then let the mixture cool. Well beat the eggs and mix with the rice. Butter a breakfast cup or small mould, fill it three parts full and bake. Turn it out on a white d'oyley, and serve with sauce.

Rice Milk.

Three tablespoonfuls of rice, one quart of milk.

Wash the rice, put it in a saucepan with the milk, and simmer gently till the rice is tender, stirring it now and then to prevent the milk burning. Sweeten a little, and serve with a cut lemon, black currant jam, or apples stewed.

Tapioca Pudding.

One ounce of tapioca, one pint of milk, one ounce of butter, two eggs, sugar to taste.

Wash the tapioca and let it stew gently in the milk for quarter of an hour, stirring it now and then. Let it cool. Mix with it the butter, sugar, and eggs, which must be well beaten; put it into a small tart dish, and bake an hour in a moderate oven.

Apple and Rice.

Take three small apples, peel and halve them, take out the cores, put them into a stewpan with about half an ounce of butter, and strew over them a little white sifted sugar. Stew them very gently till tender, taking care not to break them. Boil the rice with the milk and a little sugar till quite soft, and when done, dish it with the apples on the top of it, and a little cream served with it separately.

Milk Blancmange.

Quarter of a pound loaf sugar, one quart milk, one and a half ounces isinglass. Put all the ingredients into a lined saucepan, and boil gently till the isinglass is dissolved. Keep stirring it over the fire for about ten minutes. Strain it through a fine sieve into a jug, and when nearly cold pour it into an oiled mould. Turn it carefully out when required for use.

Rice Blancmange.

A quarter of a pound of ground rice, two ounces loaf sugar, one ounce of butter, one quart of milk, flavouring of lemon-peel. Mix the rice to a smooth batter with a little milk, and put the remainder into a saucepan with the butter, sugar, and lemon-peel. Bring the milk to boiling point, stir in the rice. Let it boil for ten minutes, or till it comes away from the saucepan. Grease a mould with salad oil, pour in the rice. Let it get perfectly cold, and turn out.

Arrow-root Blancmange.

Two tablespoonfuls of arrow-root, three-quarters of a pint of milk, lemon and sugar to taste.

Mix to a smooth batter the arrow-root with a little milk, put the rest of the milk on the fire, and let it boil, sweeten and flavour it, stirring all the time, till it thickens sufficient to come from the saucepan. Put it into a mould till quite cold.

Vermicelli Pudding.

Two ounces of vermicelli, three-quarters of a pint of milk, quarter of a pint of cream, one ounce and a half of butter, two eggs, one ounce and a half of sugar.

Boil the vermicelli in the milk till it is tender, then stir in the remaining ingredients (omitting the cream if not obtainable). Butter a small tart dish, line with puff paste, put in the pudding and bake.

Fruit Cream.

Apples, gooseberries, rhubarb, or any fresh fruit.

To every pint of pulp, one pint of milk or cream, sugar to taste. Prepare the fruit as for stewing, put it into a jar with two tablespoonfuls of water, and a little good moist sugar. Set this jar in a saucepan of boiling water, and let it

boil till the fruit is soft enough to mash. When done enough beat it to a pulp, work this pulp through a colander, and stir to every pint, the above proportion of milk or cream, of course the latter is preferable if obtainable. Sweeten, and serve in a glass dish.

Bread Jelly.

Take the crumb of a loaf, break it up, pour over it boiling water, and leave it to soak for three hours. Then strain off the water and add fresh, place the mixture on the fire, and let it boil till it is perfectly smooth; take it out and press out the water, flavour it with anything that is preferred, put it into a mould, and turn it out when required for use.

Beef Tea and Cream Enema.

Mix together four or five ounces of strong beef-tea, one ounce of cream, and half an ounce of brandy or one ounce of port wine.

To keep Milk from Turning Sour.

Fifteen grains of bicarbonate of soda to a quart of milk prevents it from turning sour.

Barley Water.

Wash a tablespoonful of pearl barley in cold water. When washed put to it two or three lumps of sugar, the rind of one lemon, and the juice of half a lemon. Pour on these a quart of boiling water, and let it stand for seven or eight hours. Strain it. The barley should never be used a second time.

Half an ounce of isinglass may be boiled in the water.

Lemonade.

Cut a lemon into five or six slices, put it into a jug with three or four lumps of white sugar. Pour over it one pint of boiling water. Cover it, and let it stand till cold. Strain and serve.

Lemonade 2.

Take two large lemons and squeeze all the juice out of them, pour one pint of spring water to the juice, add three or four lumps of white sugar. When required for use, pour half of it into a tumbler, and add half a small teaspoonful of carbonate of soda, stir well, and drink whilst effervescing.

Lemonade 3.

One and a half pint of boiling water; the juice of four lemons, the rinds of two, half a pint of sherry, four eggs, six ounces of loaf sugar. Pare off the lemon-rind thinly, put it into a jug with the sugar, and pour over the boiling

water. Let it cool, and then strain it; add the wine, lemon-juice, and eggs, previously well beaten and strained. Mix all well together and it is ready for use.

Lemonade 4.

Cut the rind of three lemons as thin as possible, add one quart of boiling water and a quarter of an ounce of isinglass. Let them stand till next day covered, then squeeze the juice of eight lemons upon half a pound of lump sugar, when the sugar is dissolved, pour the lemon and water upon it, mix well together, strain it, and it is ready for use.

Milk, Rum, and Isinglass.

Dissolve a pinch of the best isinglass in a little hot water over the fire, When dissolved, let it cool and mix with it a dessert spoonful of rum in a tumbler, fill up the glass with new milk.

Sherry or Brandy and Milk.

Put one tablespoonful of brandy, or one wineglassful of sherry into a bowl or cup. Put powdered sugar and a very little nutmeg to taste. Warm a breakfast-cupfull of new milk, and pour it into a jug with a spout. Hold it up very high, and pour it over the wine, sugar, &c. *The milk must not boil.*

Mulled Wine.

Boil some spice, cloves, nutmeg, cinnamon or mace, in a little water, just to flavour the wine. When done add a wineglass of sherry or any other wine, and some sugar, bring it to boiling point, and serve with sippets of toast. If claret is used it will require a good deal of sugar. The vessel that the wine is boiled in should be scrupulously clean, and must be kept exclusively for the purpose.

Egg and Sherry.

Beat up an egg well with a fork till it froths, add a lump of sugar, and two tablespoonfuls of water. When well mixed, pour in a wineglassful of sherry, mix it well together, and serve before it gets flat. The same may be made with half the quantity of brandy instead of the sherry.

Milk, Egg, and Brandy.

Scald some new milk, *but do not let it boil.* It ought to be put into a saucepan of boiling water, in a jug, and let to scald very gradually. When the surface looks thick it is sufficiently done, and should be put away in a cold place, in the same vessel in which it was scalded. It must not be used till quite cold; then beat up a fresh egg with a fork, in a tumbler with a lump of sugar, when beaten quite to a froth, add a dessert-spoonful of brandy, and fill up the tumbler with scalded milk.

Egg and Wine.

One egg, one tablespoonful and half a glass of cold water, one glass of sherry, sugar, and a *very* little grated nutmeg.

Beat the egg to a froth with a tablespoonful of cold water. Make the wine and water hot, *but not boiling;* pour it on the egg, stirring it all the time. Add sufficient sugar to sweeten, and a very little nutmeg. Put all into a lined saucepan, set it on a gentle fire, and stir it *one way* till it thickens, *but do not let it boil.* Serve in a glass with crisp biscuits, or sippets of toast.

Arrowroot Drink.

Mix two teaspoonfuls of arrowroot in about three tablespoonfuls of cold water, then pour in about half a pint of boiling water, when well mixed add, by degrees, half a pint of cold water, stirring it all the time, so as to make it perfectly smooth. It should be about the consistence of cream; if too thick a little more water may be added. Then pour in two wineglassfuls of sherry or one of brandy, add sugar to taste, and give it to the patient in a tumbler. A lump of ice may be added if allowed.

Nutritious Coffee.

Dissolve a little isinglass in water as above. Take half an ounce of freshly ground coffee, put it in a saucepan with one pint of new milk, which should be nearly boiling before the coffee is put in, boil both together for three minutes; clear it by pouring some of it in a cup and then back again, add the isinglass, and leave it on the hob for a few minutes to settle.

Beat up an egg in a breakfast cup and pour the coffee into it.

The coffee may be taken without the egg if preferred.

Milk and Isinglass.

Dissolve a little isinglass in water, then mix it well with half a pint of milk, then boil the milk and serve, with or without sugar, as preferred.

Milk and Cinnamon Drink.

Boil in one pint of new milk sufficient cinnamon to flavour it pleasantly, sweeten with white sugar. This may be taken cold with a teaspoonful of brandy, and is very good in cases of diarrhœa. Children may take it milk-warm without the brandy.

Demulcent Drink.

Take a pinch of isinglass and boil it in half a pint of new milk with half a dozen bruised sweet almonds, and three lumps of sugar.

Arrowroot and Black Currant Drink.

Take two large spoonfuls of black currant preserve, boil it in a quart of water, cover them and stew gently for half an hour, then strain it and

set the liquor again on the fire. Mix a teaspoonful of arrowroot in cold water, and pour the boiling liquor upon it, stirring it well; let it get quite cold.

White Wine Whey.

Take half a pint of boiling milk, and add to it one or two wineglassfuls of sherry. Strain through a fine sieve, sweeten with sifted sugar and serve.

Caudle.

Beat up an egg to a froth, add a wineglassful of sherry, and half a pint of gruel. Flavour with lemon-peel and nutmeg, and sweeten to taste.

Caudle 2.

Mix well together one pint of cold gruel with a wineglassful of good cream, add a wineglassful of sherry, and a tablespoonful of noyeau, and sweeten with sugar candy.

Egg and Brandy.

Beat up three eggs to a froth in four ounces of cold spring water. Add two or three lumps of sugar, and pour in four ounces of brandy, stirring it all the time. A few spoonfuls of this may be given at a time.

A Gruel.

Beat up an egg to a froth, add a wineglass of sherry, flavour with a lump of sugar, a strip of lemon-peel, and a little grated nutmeg. Have ready some gruel, very smooth and hot, stir in the wine and egg, and serve with sippets of crisp toast. Arrowroot may be made in the same way.

Thirst in fevers can be assuaged by the use of whey, or water acidulated with currant jelly or raspberry vinegar, or a light infusion of cascarilla, acidulated with a small quantity of muriatic acid.

Restorative Soup.

Take one pound of fresh beef free from fat, chop it up fine, and pour over it eight ounces of soft water, add five or six drops of hydrochloric acid, and fifty or sixty grains of common salt. Stir them well, and leave it for three hours in a cool place.

Then pass the fluid through a hair sieve, pressing the meat slightly, and adding about two more ounces of water gradually as it runs through. The liquid thus obtained will be of a red colour, possessing the taste of soup. It should be taken cold, a teacupful at a time. If preferred warm, it must not be put on the fire, but in a covered vessel, which should be placed in hot water.

Should it be undesirable for the patient to take the acid, this soup may be made by merely soaking the minced beef in distilled water.

Essence of Beef.

Take one pound of gravy beef, free from fat and skin, chop it up very fine, add a little salt, and put it into an earthen jar with a lid, fasten up the edges

with a thick paste, such as is made for roasting venison in, place the jar in the oven for three or four hours. Strain through a coarse sieve, and give the patient two or three teaspoonfuls at a time.

Essence of Beef 2.

One pound of lean beef cut from the sirloin or rump, half pint of cold water.

Cut up the meat in small pieces, and place it in a covered saucepan by the side of the fire for four or five hours, then allow it to simmer gently for two hours. Skim it well and serve.

Mutton Jelly.

Six shanks of mutton, one and a half quarts of water, pepper and salt to taste, half pound lean beef, a crust of bread toasted brown.

Soak the shanks in water several hours, and scrub them well. Put them and the beef and other ingredients into a saucepan with the water, and let them simmer very gently for five hours. Strain it, and when cold, take off the fat; warm up as much as required when wanted.

Nourishing Soup.

Wash two ounces of the best pearl sago well, then stew the sago in a pint of water till it is quite tender and very thick. Mix it with half a pint of good boiling cream, and the yolks of two fresh eggs. Mix the whole carefully with one quart of essence of beef, made as above. The beef essence must be heated separately, and mixed while both mixtures are hot. A little of this may be warmed up at a time for use.

Beef Tea with Oatmeal.

Take two tablespoonfuls of oatmeal, mix very smooth with two spoonfuls of cold water. Then add a pint of strong boiling beef tea. Boil it together for five or six minutes, stirring it well all the time. Strain it through a sieve and serve.

Baked Soup.

One pound of lean beef, one ounce of rice, pepper and salt to taste, one pint and a half of water. Cut up the meat into slices, add the rice and seasoning. Put all into a jar with the water, cover it closely, and bake in the oven for four hours. Pearl barley may be substituted for rice if preferred.

Mutton Broth.

One pound of the scrag end of neck of mutton, two pints of water, pepper and salt, half pound potatoes, or some pearl barley. Put the mutton into a stewpan, pour over it the water, pepper and salt. When it boils skim it carefully, cover the pan, and let it simmer gently for an hour. Strain it, let it get cold, and then remove all the fat. When required for use add some pearl barley, or potatoes in the following manner:—Boil the potatoes, mash them very

smoothly, see that no lumps remain. Put the potatoes into a pan, and gradually add the mutton broth, stirring it till it is well mixed and smooth; let it simmer for five minutes, and serve with fried bread.

Soup.

Take three or four potatoes, pared, a thick slice of bread, half a teacupful of pearl barley or rice, a little salt and pepper, two quarts of beef tea or mutton broth. Put the beef tea or broth into a pan, and boil it up, when quite boiling, add the rest of the ingredients, except the pepper and salt, which should be added when nearly done, cover the pan, and let it boil slowly for an hour. Serve with toasted bread.

Rabbit Soup.

Take a rabbit and soak it in warm water. When quite clean, cut it in pieces, and put it into a stewpan, and a teacupful of veal stock or broth, simmer slowly till done through, and then add one quart of water, and boil for an hour. Take out the rabbit, pick the meat from the bones, covering it up to keep it white; put the bones back into the liquor and simmer for two hours, skim and strain, and let it cool. Pound up the meat in a mortar, with the yolks of two hard boiled eggs, and the crumb of a French roll, previously soaked in milk; rub it through a tammy and gradually add the strained liquor, and simmer for fifteen minutes. If liked *thick*, mix some arrowroot with half a pint of new milk, bring it to a boil, mix with the soup and serve. If preferred thin, have ready some pearl barley and vermicelli boiled in milk and add to the soup instead of the arrowroot. Serve with little squares of toast, or fried bread.

Calf's Foot Broth.

One calf's foot, three pints water, one small lump of sugar, the yolk of one egg.

Stew the foot in water, *very gently*, till the liquor is reduced to half; remove the skum, set it in a basin till quite cold, then take off every particle of fat. Warm up about half a pint, adding the butter and sugar, take it off the fire for a minute or two, then add the beaten yolk of the egg; keep stirring it over the fire till the mixture thickens, *but do not let it boil*, or it will be spoiled.

Veal Soup.

A knuckle of veal, two cow-heels, twelve pepper corns, one glass of sherry, two quarts of water.

Put all these ingredients into an earthen jar, and stew six hours. Do not open it till cold. When wanted for use, skim off the fat and strain it; place on the fire as much as you require for use. Serve very hot.

Good Stock for Soup.

One pound of shin of beef, one pound of knuckle of veal, four white peppercorns, a lump of sugar, one quart of water.

Simmer gently for six hours, skim well and strain.

Sago Soup.

One and a half ounce of sago, one pint of stock. Wash the sago in boiling water. Put one pint of stock on the fire and bring it to a boil, add the sago by degrees, and simmer till the sago is entirely dissolved. When cold it will form a jelly.

Rice Soup.

Three ounces of Patna rice, the yolks of two eggs, half pint of cream or new milk, one quart of stock.

Boil the rice in the stock, and rub half of it through a tammy, put the stock in a stewpan, add the rest of the rice, whole, and simmer gently for five minutes. Have ready the cream or milk, boiled. Beat the yolk of the eggs, mix them gradually with the cream. Take the soup off the fire, add the cream and eggs, stirring them well together as you mix them. Heat it up gradually, but *do not let it boil,* or the eggs will curdle and the soup be spoilt.

Semolina Soup.

One ounce of semolina, one pint of stock. Drop the semolina into the boiling stock, and keep constantly stirring to prevent burning. Simmer gently for half an hour. Season with salt to taste.

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